THE IRON TRADE REVIEW

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RAILROAD BUYING

IS A FACTOR OF INCREASING IMPORTANCE.

Harriman Allotment Announced — More Orders for Cars Placed— Activity in Building Continues.

Mill activities continue to increase, and with the exception of the danger of a strike against the open shop policy of the American Sheet & Tin Plate Co., developments in the iron world are favorable. A number of additional orders for cars have been placed, and many more are expected at an early date. The rail and billet division of one large interest has rolling orders so far this month exceeding by more than 22,000 tons those of the same period in May, and in this tonnage the rail business was comparatively light, showing what a good record is being made in semi-finished steel. Our reports from England indicate that conditions are fair, but in Germany there are large accumulations of coke and pig iron and business in general is poor.

Structural Material

In the erection of new buildings, activity continues, and one of the most important firms of architects in the country reports that it is having more building and rebuilding plans presented than at any time in its history. In the Chicago district it is estimated that projects involving 100,000 tons are being figured, and the contracts closed by the leading interest in that territory last week amounted to about 6,000 tons. Among the new contracts are a smelter at Kelvin, Ariz., 3,200 tons, to the Kansas City Structural Steel Co.; an apartment house in New York, 2,700 tons, to A. E. Norton & Co.; city hospitals at San Francisco, 3,500 tons, to the American Bridge Co., which also took the Borland warehouse, Chicago, 700 tons, and an addition to the Pontchartrain hotel, Detroit, 750 tons. One steel company is having difficulty in filling its contracts, and has been trying to buy small shapes.

Railroad Orders

The apportionment of the Harriman rail contract is as follows: Illinois Steel Co., 80,000 tons, 10,000 tons of which will be rolled at Gary; the Carnegie Steel Co., 12,000 tons; Tennessee Coal, Iron & Railroad Co., 19,000 tons; Colorado Fuel & Iron Co., 22,000 tons. The St. Louis & Southwestern Railway has awarded its contract for 17,000 tons to the Illinois Steel Co., which also secured miscellaneous orders for about 3,000 tons, and now has on its books for delivery this year about 500,000 tons of standard sections, while Gary has about 175,000 tons. Among the orders for structural work awarded by the railroads were the Renslow viaduct in Washington, 800 tons, to the Pennsylvania Steel Co.; viaduct across the Dominion creek, Montana, to be built by the St. Paul, 600 tons, to the Riter-Conley Co.; the Peoria bridge for the Peoria & Pekin Union Railway, 1,900 tons, to the McClintic-Marshall Construction Co., and the Reading bridge work, Philadelphia, 3,500 tons, to the American Bridge Co. The Reading has ordered 500 steel cars from the Standard Steel Car Co., the steel to be furnished by the Carnegie Steel Co. The Central of New Jersey has ordered 500 steel gondolas of the American Car & Foundry Co., and an order for 1,000 steel hoppers will go to the Standard Steel Car Co. Present plans of the Baltimore & Ohio call for 3,500 freight cars, 70 passenger coaches, and 50 locomotives, but it is expected that the entire purchase this year will exceed 10,000 cars. The Great Northern is inquiring for 1,000 box cars.

Sheets and Plates

The plate market shows considerable improvement. The South Chicago mill has closed contracts for 7,000 tons since June 1. Inquiries for from 4,000 to 5,000 tons for oil field work are pending. Two lake vessels just ordered will require 8,000 tons of plates and shapes. No negotiations for peace between the American Sheet & Tin Plate Co. and the union have been started, and a strike seems certain. The company is now operating 74 per cent of its capacity, while the independents are operating 80 per cent. Bar iron shows some improvement and a heavy increase in business is hoped for as a result of the extensive railroad buying now developing.

Pig Iron Conditions

No important transactions are reported in pig iron, although there is a steady run of small orders, and prices are well maintained. While the demand for spot and third quarter iron in the south is dull and not very active for fourth quarter, there is underlying strength owing to the positive evidence of an increase in the melt, and a firm offer from St. Louis of $11.50 Birmingham for 3,000 tons of No. 2 foundry for storage on yard, and for cash upon receipt of storage yard warrant, was declined by the furnace interest. Southern sellers are not pushing their product.

LOWEST ON FRISCO CONTRACT.

(Special Telegram.)

Pittsburg, June 23.—The Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa., is the lowest bidder for the high pressure fire line valves for the city of San Francisco. This company bid $342,398. The contract has not been awarded, but this action will be taken within the next few days.

THE WEEK IN IRON CENTERS

PITTSBURG.

June Business Surpassing May—Sale of Southern Pig Iron.

Office of THE IRON TRADE REVIEW,
510 Park Bldg., June 22.

The revival of activity in the iron and steel trade is holding up with unabated strength. Generally the movement continues to be progressive and tonnage being entered for nearby shipment is gradually mounting toward normal proportions. Since January the volume of orders to some very important steel interests in this district has practically doubled.

While the month of May was the best since the depression and was replete with evidence of returning prosperity in the industry, the elapsed period of June has more than held its own. Steel bar orders the first half of the present month are in excess of May, and in semi-finished steel a marked increase has been noted by the large producers in the Pittsburg territory. This is a favorable reflection of the increased consumption by manufacturing interests which are buyers of their steel. Price advances are being made with caution, as great care is being exercised not to place any possible obstacles in the path of the recurring activity.

The labor situation growing out of the open shop declaration of the American Sheet & Tin Plate Co. owing to the determination of the Amalgamated Association of Iron, Steel and Tin Workers to resist this order, has not produced any outward developments in the week. No conciliatory move has been made by either party and, rather, preparations have been made to meet the exigencies arising from a strike condition. The American Sheet & Tin Plate Co. has put its idle non-union plants in shape for operation, while the workmen are laying their plans to carry their fight into the unorganized mills of the company. A conference with the independent sheet and tin plate companies which usually adopt the union scales arranged with the American Sheet & Tin Plate Co. will shortly be held by the Amalgamated association to determine the position of these plants in the pending controversy. This week a second conference is being held by the Amalgamated association with the representatives of the Western Bar Iron Association in an effort to fix the new bar iron scale effective July 1. The first meeting this year between the manufacturers and the men failed to bring about an agreement, the former requesting a reduction from the present scale.

Pig Iron.—Following a general advance of at least 25 cents in all grades, comparative quietness has ruled in pig iron during the past week. Beyond some steel-making iron inquiries to other districts, there have been no especially attractive tonnages for local furnaces and sellers to work upon. Recent buying, however, has been in good volume and the present lull is regarded as a natural development. Idle valley furnaces are preparing to get into blast.

A Canadian steel company is in the market for from 3,000 to 5,000 tons of Bessemer for prompt shipment. Bessemer is selling at from $15.25 to $15.50 valley. A local interest this week bought 250 tons for third quarter at $15.25 valley. In basic, large blocks of iron have been offered at $15 valley by sellers, while consumers are opening negotiations at $14.75 valley without takers. The market has strengthened to $15 valley. A third quarter sale of 300 tons to this district this week brought the latter price. A Canton, O., steel company is out for 3,000 tons of basic for practically prompt shipment. The foundry market is quoted at from $15 to $15.50 valley, a number of furnaces holding strictly to the higher quotation. A lot of 200 tons of No. 2 for third quarter delivery outside this district went at $15 valley. There have been some large inquiries for forge in the market from steel companies, but these evidently have been merely to sound the general market.

An interesting development in this market the past week, was the sale of a round tonnage of No. 2 southern iron to a Pittsburg melter for prompt shipment at $11.50 Birmingham or $16.40 delivered. This is the first transaction in southern iron to be reported in the Pittsburg district in many months, as ordinarily the $4.90 freight rate from Birmingham has been prohibitive and it emphasizes the strength of valley and nearby iron. A northern Ohio melter also purchased 1,000 tons of No. 2 for third quarter at $11.50 Birmingham or $15.85 delivered.

The Alice and Sharpsville stacks at Sharpsville, Pa., in the Shenango valley are preparing to blow in and will resume iron making in a few days. Both stacks will run on Bessemer.

On prompt and third quarter shipment on northern iron, we quote as follows:

Bessemer, valley	$15.25 to 15.50
Bessemer, Pittsburg	16.15 to 16.40
No. 2 foundry, Pittsburg	15.90 to 16.40
Gray forge, Pittsburg	14.90 to 15.15
Basic, valley	15.00 to 15.25
Basic, Pittsburg	15.90 to 16.15

Ferro-Alloys.—Some large transactions in ferro-alloys have been put through in this district within the past week. A large steel interest took on 1,000 tons of ferro-manganese for fourth quarter at $41 seaboard, this being in addition to large purchases for last half delivery made some time ago. A lot of 500 tons of 11 per cent ferro-silicon for last half was also taken at a reported low price. Fifty per cent ferro-silicon is now selling at from $62.50 to $63.50 Pittsburg, the prompt market having eased off considerably. Carload sales for immediate shipment were made at these figures the past week, and there are some carload inquiries out. The ferro-manganese market appears to have stiffened in the last few days and we quote this market at from $41.50 to $42 seaboard at present duty with a freight rate of $1.95 to Pittsburg.

Fifty per cent ferro-silicon is quoted at $62.50 to $63.50 Pittsburg on forward deliveries, duty to account of buyer; domestic, 12 per cent, $25; 11 per cent, $24; 10 per cent, $23 Pittsburg.

Plates.—The Philadelphia & Reading railroad has awarded 500 steel cars to the Standard Steel Car Co., and the plates and shapes, about 5,000 tons, will be furnished by the Carnegie Steel Co. The Central of New Jersey railway has closed with the American Car & Foundry Co. for 500 steel gondolas, and the 1,000 steel hoppers, the remainder of its recent inquiry for 1,500 cars, will likely go to the Standard Steel Car Co. For the 500 cars awarded the American Car & Foundry Co., the Carnegie Steel Co. will supply the shapes, about 2,000 tons, while the plates will go to some other mill, probably the Jones & Laughlin Steel Co. The Baltimore & Ohio railroad has made provisional overtures on car purchases which will eventually run into large figures, but it is understood the present plans of the company contemplate the purchase soon of 3,500 freight cars, 70 passenger cars, 5 mail cars and 50 locomotives. Tank plates, which have not been in strong demand, are showing improvement, and there are inquiries out for from 4,000 to 5,000 tons for oil field work. Speci-

fications to the mills in general plate material continue heavy. Present regular prices run from 1.30c to 1.35c, but it is reported there is still some shading of the former figure. We quote the present market as follows:

Tank plates, ¼-inch thick, 6¼ to 100 inches, 1.25c to 1.35c mill. Extras are as follows per 100 pounds: Boiler and flange steel plate, 0.10c; A. B. M. A. and ordinary firebox steel plates, 0.20c; still bottom steel, 0.30c; marine steel, 0.40c; locomotive firebox steel, 0.50c; all sketches, excepting straight taper plates varying not more than 4 inches in width at ends, narrowest end not being less than 30 inches, 0.10c; circles, 0.20c. Plates in widths over 100 inches up to 110 inches, 0.05c; over 110 inches up to 115 inches, 0.10c; over 115 inches up to 120 inches, 0.15c; over 120 inches up to 125 inches, 0.25c; over 125 inches up to 130 inches, 0.50c; over 130 inches, 1c. Gages under ½-inch to and including 3/16-inch plate on thin edges, 0.10c; under 3/16 to and including No. 9, 0.25c. Five cents extra for less than carloads. Terms, net cash in 30 days.

Sheets.—Specifications in sheets to the mills are usually accompanied by urgent shipping instructions, as, generally speaking, stocks with jobbers and manufacturers are low. A few of the large jobbers are, however, well supplied on store goods. The current volume of business being booked by the mills is very favorable. Sheet prices continue stronger and concessions are not so general, but some shading is still being encountered. In corrugated roofing sheets, deliveries are not promised insde of 30 days. The American Sheet & Tin Plate Co. this week is running its Guernsey plant full and has in operation 138 mills, or 74 per cent of its total capacity, compared with 130 mills or 70 per cent last week. The independents are working 80 per cent of their capacity. We quote present minimum prices which are subject to some shading, as follows:

Blue annealed sheets, Nos. 10 and heavier, 1.60c; Nos. 11 and 12, 1.65c; Nos. 13 and 14, 1.70c; Nos. 15 and 16, 1.80c; box annealed sheets, Nos. 10 to 12, 1.85c; Nos. 13 and 14, 1.90c; Nos. 15 and 16, 1.95c; Nos. 17 to 21, 2c; Nos. 22 to 24, 2.05c; Nos. 25 and 26, 2.10c; No. 27, 2.15c; No. 28, 2.20c; No. 29, 2.25c; No. 30, 2.35c; galvanized sheets, Nos. 13 and 14, 2.25c; Nos. 15 and 16, 2.40c; Nos. 17 to 21, 2.50c; Nos. 22 to 24, 2.65c; Nos. 25 and 26, 2.85c; No. 27, 3.05c; No. 28, 3.25c; No. 29, 3.40c; No. 30, 3.65c; painted roofing sheets, $1.55 per square for No. 28 gage, 2½-inch corrugation, and galvanized roofing sheets, $2.80 per square for No. 28 gage, 2½-inch corrugation.

Tin Plate.—No conferences have been held between the American Sheet & Tin Plate Co. and the Amalgamated Association of Iron, Steel and Tin Workers, on the former's open shop order which the workmen propose to resist. Neither party has made any conciliatory advances and it appears quite certain that the men will strike against the union plants of the company July 1. The Amalgamated association will soon confer with representatives of the independent sheet and tin plate manufacturers who operate union plants, and it is very probable that some arrangement will be reached by which the latter will be permitted to operate their plants on provisional scales during the controversy over the open shop question with the American Sheet & Tin Plate Co. The movement in tin plate continues heavy and the mills are accumulating enough tonnage to insure their present activities for several months ahead. Operations have not changed, the leading interest working 83 per cent and the independents about 90 per cent of their capacity. Tin plate prices are regular and we quote the present market as follows:

Coke tin plate, 100-pound basis, 14 x 20, $3.45 f. o. b. mill Pittsburg district and $3.40 in large lots. Terms 30 days less 2 per cent for cash in 10 days.

Rails and Track Material.—Some of the Argentine order recently placed will likely be rolled here. The rail situation shows improvement in every respect. Inquiries are more plentiful and after the expiration July 1 of the fiscal year for many of the railroads, it is believed some important contracts will be placed. The Carnegie Steel Co. last week received specifications for 5,360 tons of standard sections from the Erie railroad to apply against an old contract, and entered 1,500 tons of light rails. Some makers of spikes have been quoting low prices. We quote the market on Bessemer rails as follows, the price on open-hearth rails being $30 mill:

Fifty-pound and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails in lots up to 250 tons, 8-pound, $29; 12-pound, $28; 16 to 25-pound, $27; 30 to 35-pound, $26.75, 40 to 45-pound, $26; on lots over 250 tons, prices are 60c less, and over 500 tons, $1 less; angle splice bars for standard sections, 1.50c Pittsburg; standard spikes, 1.55c to 1.70c Pittsburg; hand spikes, 1.55c to 1.70c Pittsburg.

Steel.—The mill orders entered in semi-finished steel by important makers are running at a larger tonnage rate than during the corresponding period in May, which was the best month since the depression. One important interest at the close of business last Saturday was 22,000 tons ahead of its tonnage booked upon the same date in May, and most of these orders were for semi-finished steel. Open-hearth billets are still in strong demand and are not readily obtainable. Makers generally are asking premiums over the nominal $23 Pittsburg price. In some cases quotations for open-hearth rolling billets range from $25 to $26 Pittsburg. Several interests which have been making concessions in Bessemer steel have strengthened their price views and this market is now fairly strong at $23 Pittsburg. A number of the important sheet bar makers are not anxious for additional business, and quotations are firm.

Bessemer 4 x 4 billets with 0.25 carbon and less are regularly quoted at $23 Pittsburg, with the usual extras for size and analysis, and open-hearth rolling billets from $23 to $25 Pittsburg. Forging billets range from $25 to $27 Pittsburg. The regular quotation on sheet and tin bars is $25 Pittsburg. Steel makers divide with consumers the freight within the $1 limit, making the price in such territory $23.50 to $25.50 delivered on billets, and $25.50 delivered on sheet bars.

Hoops and Bands. — Prices of hoops have firmed up somewhat and makers are not willing to accept contracts at less than 1.50c Pittsburg. Any concessions occasionally being made from this figure apply only to desirable specifications for immediate shipment. The market shows more activity and some branches of the cooperage trade are ordering more briskly. We quote the present market as follows:

Hoops in carload lots, 1.50c; in less than carload lots, 1.60c; bands, 1.20c, base half extras as per standard steel.

Merchant Bars.—The heavy movement in steel bars shows no signs of diminution. Total specifications being booked continue to increase and the June tonnage to date is larger than that of a similar period in May, which was the month of largest tonnage since the depression. Steel bar deliveries are now ranging from three to four weeks on general sizes. The Jones & Laughlin Steel Co., Republic Iron & Steel Co. and the Cambria Steel Co. are still asking 1.25c on steel bars, while the

Carnegie Steel Co. holds its base at 1.20c Pittsburg, although in some cases it also has been quoting 1.25c. The bar iron trade, particularly in the west, is showing considerable improvement, and some large makers who are running their western plants at about 75 per cent of capacity, report that June will be the best month for them in almost two years. This demand is coming from consumers who are regular users of iron. Bar iron prices in the west, which have ranged as low as 1.20c, are now about 1.35c western mill. Pittsburg mills are asking 1.45c, but a sale was made the past week for Buffalo shipment at 1.40c Pittsburg. Shafting discounts are still irregular. We quote the present market as follows:

Common iron bars, 1.40c to 1.45c, Pittsburg; Bessemer and open-hearth steel bars, 1.20c to 1.25c; plow and cultivator, 1.20c to 1.25c; channels, angles, zees, tees, under 3-inch, 1.30c, all f. o. b. mill. The following differentials are maintained on steel: Less than 2,000 pounds, 0.10c advance; less than 1,000 pounds of a size, 0.30c advance. Cold rolled and ground shafting, 60 per cent in carloads, and 55 per cent in less than carloads, delivered in base territory. Planished and machine straightened tire is 1.40c base; iron finished tire under 1½ by 1½ inches, 1.35c, both plus ½ extra on tire card; iron finished tire, 1½ x ½ and over, 1.20c, plus ½ extra on the steel bar card.

On cold rolled strip steel, width 1½ inches and wider, and 0.100 inch and thicker, we quote base prices for 100 pounds, $3.05 on hard, and $3.30 on soft.

Structural Material.—Prominent architectural companies whose business is national in scope declare that more structural projects are being brought to their attention at present than at any previous time in their history. Many of these undertakings are in a tentative form, but they have reasonable prospects of being put through. New inquiry during the past week has not been especially heavy. Normally by the midyear, the railroads have closed for most of their tonnage and fabricating interests do not anticipate heavy contracting from this source over the last half. The McClintic-Marshall Construction Co. in the week took the new bridge for the Peoria & Pekin Union railroad at Peoria, Ill., which will require 2,300 tons. Wm. B. Scaife & Sons Co., Pittsburg, took the contract for an addition to the plant of the Driggs-Seabury Ordnance Corporation of Sharon, Pa. We quote the present market on structural shapes as follows:

Beams and channels, 15-inch and under, 1.30c to 1.35c; over 15 inches, 1.40c to 1.45c; zees, 1.30c to 1.35c; tees, 1.30c to 1.35c; angles, from 3 to 6 inches, 1.30c to 1.35c; over 6 inches, 1.40c to 1.45c; universal and sheared plates, 6¼ inches wide and wider, 1.30c to 1.35c.

Merchant Pipe.—Some makers of iron pipe have reduced their discounts one point, which is equivalent to an advance of $2 a ton. There has been no change in steel pipe prices, however. A number of makers find their books well filled on lap-welded and iron pipe and are reluctant to take on additional business at present without a careful consideration of the offered tonnage. The present movement in merchant pipe, line pipe and oil and gas country goods is heavy, and prospects in the market are excellent. A sale of the week was for from 10 to 12 miles of 6-inch pipe for a gas line in the east. The Youngstown Sheet & Tube Co. has its entire works running at fullest capacity. Merchant pipe prices are strong but line pipe is not so firm. We quote the following official discounts on merchant pipe, subject to an additional one point and five off to jobbers:

	—Steel—		—Iron—	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch.....	72	56	69	..
⅜ inch	73	59	70	56
½ inch	76	64	73	61
¾ to 6 inch.....	80	70	77	67
7 to 12 inch.....	75	60	72	57
PLUGGED AND REAMED.				
1 to 4 inch.....	78	68	75	65
EXTRA STRONG PLAIN ENDS.				
⅛ to ¾ inch.....	65	53	62	50
½ to 4 inch.....	72	60	59	57
4½ to 8 inch.....	68	56	65	53
DOUBLE EXTRA STRONG PLAIN ENDS.				
½ to 8 inch.....	61	50	58	47

Boiler Tubes.—Only a moderate activity continues in the tube market. Charcoal iron tubes are moving fairly well to the railroads for locomotive service, but merchant tubes are not in great demand. Some irregularity in tube prices prevails. We quote the following official discounts on lap-welded steel boiler tubes to jobbers in carloads:

1 to 1¼ inch.....	50
1¼ to 2¼ inch.....	62
2½ inch	64
2¾ to 5 inch.....	70
6 to 13 inch	62

2½ inch and smaller, over 18 feet, 10 per cent net extra.
2¾ inch and larger, over 22 feet, 10 per cent net extra.
To destinations east of the Mississippi river will be sold at delivered discount for carloads lowered by two points, for lengths 22 feet and under; longer lenghts, f. o. b. Pittsburg.

We quote the following official discounts on charcoal iron tubes to jobbers:

1 to 1¼ inch.....	45
1¼ to 2¼ inch.....	45
2½ inch	50
2¾ to 5 inch	57
6 to 13 inch.....	45

Wire Products.—Unshipped tonnage on the books of the wire companies is very heavy, having been entered largely at the low prices which ruled for a short time in May. Since then, however, considerable additional specifications have been received and there is a fair amount of current ordering. The nail and wire companies are not accepting business for shipment after Sept. 1 at today's prices. Deliveries are somewhat backward. We quote the present market in wire products as follows:

Wire nails, jobbers' carload lots, $1.70; retailers' carload lots, $1.75; painted barb wire, jobbers' carload lots, $1.70; retailers' carload lots, $1.75, with 30c for galvanizing; plain wire to jobbers in carloads, $1.50, and to retailers in carloads, $1.55; polished staples, $1.70; galvanized staples, $2.

Wire Rods.—Little business in wire rods has been closed since the contracting which was done at the concessions available a short time ago. There is considerable specifying against contracts. We quote present prices at $28 to $29 Pittsburg on Bessemer and $29 to $30 on open-hearth rods.

Coke.—Not a great deal of new contracting in coke, either furnace or foundry, is being done. Some large contracts have, however, recently been made for the future requirements of furnaces now active or of those which are expecting to blow in shortly. A Shenango valley interest took 15,000 tons for third quarter at $1.60 ovens. An eastern furnace bought about 17,000 tons for delivery up to July, 1910, at $1.75 ovens for the present year and $2 ovens for the next year delivery. We quote spot furnace coke at from $1.50 to $1.60 ovens, and on contract from $1.60 to $1.70 ovens, according to grade. On first class Connellsville foundry coke, the range is from $1.80 to $2 ovens for prompt shipment, and on contract from $1.90 to $2.25 ovens. The *Courier's* figures for the week ending June 12 show 27,770 ovens active with an output of 299,486 tons, compared with 25,100 active ovens and a production of 291,686 tons the previous week.

Old Material.—The market in heavy steel has eased off somewhat, as the mills, having bought for their requirements several months ahead, are not willing to take on much additional tonnage at the present prices. They are offering around $15.50 this district, but this figure is not attractive to dealers who are disposed to hold their accumulations. The present market may be termed quiet but firm. Not a great deal of cast scrap is being

taken, but the available supply is also quite moderate. Wrought is not moving very well. A recent exchange deal whereby low phosphorus scrap was given by a steel company in return for heavy steel has left considerable of the former grade in the market at high asking prices by reason of the advanced level at which deliveries of the steel were made. We quote gross tons, delivered in the Pittsburg district, as follows:

Heavy melting scrap, $15.50 to $16; re-rolling rails, $15.75 to $16.25; bundled sheet scrap, $13 to $13.50; iron axles, $21 to $22; old iron rails, $18 to $18.50; No. 1 wrought scrap, $15.50 to $16; old car wheels, $15.50 to $16; low phosphorus, $18.50 to $19; machine shop turnings, $11.50 to $12; cast borings, $9.50 to $10; No. 1 cast scrap, $15 to $15.50; malleable, $15 to $15.50; stove plate, $11.50 to $12.

CHICAGO.

Heavy Inquiry for Car Material—Harriman Rail Allotment Announced.

Office of THE IRON TRADE REVIEW,
1328 Monadnock Block, June 22.

Activity in this market is largely for heavy finished material. There was some revival in pig iron caused by the withdrawal of all its quotations by a local house, which resulted in several desirable orders being placed, but no noticeable tonnage was covered, nor have prices changed. From a tonnage standpoint, rails and track supplies still lead. A development, however, of greater interest to the trade at this time is the heavy inquiry for car material. Within the week, mills have been asked to name deliveries and prices on the necessary material for 10,000 cars, and, as this is the first large lot to be figured on in many months, the incident is receiving considerable attention. The contracts are not expected to be let until after the first of July in order to bring their cost into the expenses of the new fiscal year, but it is believed their letting will be quickly followed by other heavy purchases since it is known that 60,000 cars are in the market. The apportionment of the Harriman rail order has been announced. Of the 150,000 tons ordered, 80,000 tons go to the Illinois Steel Co. of which 10,000 tons will be rolled at Gary. The pressure for deliveries of rails and track supplies is as keen as that for other materials. All the local plants are running to full capacity, but despite this they are unable to keep pace with their specifications. Six to eight weeks is the best that can be done on sheets; two to three weeks on plates; six to eight weeks on structural steel and two to six weeks on merchant bars. New tonnage booked frequently exceeeds the output, while specifications have been in excess of it for the last month. The billet mill at Gary is expected to be in operation about Aug. 1, and it is stated that the American Bridge Co. will start work on its fabricating plant in that city about the same time. These shops will have a capacity of 1,000 tons per day. There is beginning to be felt a pressing need for both plants. Intermediate steel is scarce, and the western fabricating shops are rapidly filling up. The Illinois Steel Co. has an order for 5,000 tons of billets for export as well as a large tonnage of axle billets on its books which are waiting to be rolled at Gary. There is an excess of fabricating tonnage in this market, and deliveries are assuming a greater importance than price. It is estimated that in this city alone there are building projects pending involving 100,000 tons of steel. The Western Bar Iron Association will meet with the Amalgamated Association this week at Cambridge Springs, Pa., to adjust their differences, and this meeting will be followed by one with the independent sheet manufacturers on June 29. An amicable adjustment will result in both bar iron and sheet interests opening their books for longer deliveries than they now care to take.

Pig Iron.—In its broader aspect, the market is strong. Signs are plentiful that an upward movement is imminent, but only a lethargic interest is shown in forward commitments. The leading southern producer continues to offer iron for the last half on the basis of $11.50 for No. 2, but it is practically alone in this price. The other furnaces are quoting $12 Birmingham, and the Republic Iron & Steel Co., which is out of the market for the third quarter, is asking $12.25 for the last quarter. There was some activity in northern iron during the week following the withdrawal of all its quotations by one local furnace. The northern schedule is still based on $16 furnace for No. 2, but an advance is predicted in a short while. It is reported there was active buying during the week from the Milwaukee stack by interests in that city, about 12,000 tons being taken up. There has also been some movement in charcoal iron this week and prices are stiffer. A little tentative inquiry has sprung up on 1910 shipments, and one northern furnace made a price of $17.50 Chicago for the delivery. Announcement is made that the Red River furnace at Clarksville, Tenn., was blown in last week after an idleness of 90 days. We quote for Chicago delivery as follows:

Lake Superior charcoal	$19.50 to 20.00
Northern foundry No. 1	17.00 to 17.50
Northern foundry No. 2	16.50 to 17.00
Northern foundry No. 3	16.00 to 16.50
Southern foundry No. 1	16.35 to 16.85
Southern foundry No. 2	16.85 to 16.35
Southern foundry No. 3	15.35 to 15.85
Southern foundry No. 4	14.85 to 15.35
Southern No. 1 soft	16.35 to 16.85
Southern No. 2 soft	15.85 to 16.35
Southern gray forge	13.85 to 14.35
Southern mottled	13.60 to 14.10
Southern silveries, 4 per cent silicon	17.35 to 17.85
Southern silveries, 5 per cent silicon	17.85 to 18.35
Southern silveries, 6 per cent silicon	18.85 to 19.85
Jackson Co. silveries, 6 per cent	19.90
Jackson Co. silveries, 8 per cent	20.90
Jackson Co. silveries, 10 per cent	21.90
Malleable Bessemer	16.50 to 17.00
Standard Bessemer	17.00 to 17.50
Alabama basic	15.85 to 16.85

Billets.—Specifications against existing contracts are plentiful, the largest of the week being for 5,000 tons. Mills are not desirous of adding much new tonnage to their books, and the sale of 1,000 tons of forging billets to a Milwaukee concern is therefore conspicuous. Prices are firm at $24 Chicago for 4x4 rolling billets, and at $26 base for forging billets.

Merchant Bars.—There is very little change to note in bars. The consumption of steel shows no diminution, and in addition to the large specifications which come in daily, all the local mills are booking considerable new tonnage. During May, which is usually regarded as an off month for new business, one local interest added over 6,000 tons to its books, for deliveries in the remainder of this year. The most hopeful sign, however, is the inquiry for car material. Bar iron mills especially are figuring on a large tonnage for this consumption, although it is not expected that many orders will be placed until after the close of the mid year, which is usually the termination of the fiscal year of railroads. But there is every indication that mills will be swamped with railroad car builders' orders during the last half, and it behooves other interests to get in their specifications early to insure their deliveries. While an occasional concession in bar iron is heard of, the market is being well maintained on the basis of 1.35c Chicago. Hard steel is in fair demand, but without any change in price. We quote as follows:

Bar iron, 1.30c to 1.35c; hard steel bars, 1.25c to 1.30c; soft steel bars and bands, 1.35c to 1.38c; half extras; soft steel angles, less than 3 x 3, 1.48c; hoops, 1.78c base, full extras, planished or smooth finished tire steel, 1.58c; iron finish, up to 1½ x ½-inch, 1.53c base tire card; iron finish, 1½ x ½-inch and larger, 1.38c base steel

card; channel for solid rubber tire, ¾ to 1 inch, 1.88c, and 1⅛-inch and larger, 1.78c; smooth-finished machinery steel, 1.63c; flat sleigh shoe, 1.43c; concave and convex sleigh shoe, 1.63c; cutter shoe, 2.75c; toe calk steel, 1.93c; railway spring steel, 1.78c, base vehicle card; crucible 1.73c, base steel card; vehicle spring tool steel, 7c to 9c, with higher prices asked on special grades. Quotations on shafting are 60 per cent off the list for carload lots, and 55 per cent off for less than carload lots, carload freight allowed to points in base territory. On iron and steel bars from local stocks, we quote as follows: Bar iron, 1.70c to 1.80c, full extras; soft steel bars, 1.50c per 100 pounds base, plus half extras; soft steel hoops, 2.10c, full extras.

Plates.—The volume in which business is coming in is evidenced by the fact that the South Chicago mill received in one day more specifications than it can roll in a week. New business aggregating over 7,000 tons has been closed by the same interest since June 1, further indicating a sharp activity in fabricating lines. Deliveries can still be given in two or three weeks, but this cannot hold good long at the present rate of consumption. Mills have been asked to quote prices on the material for 5,000 cars for the Harriman lines; 2,200 cars for the Chicago & Northwestern; 1,000 cars for the Great Northern; 1,000 cars for the Northern Pacific, and 500 cars for the Ann Arbor road. The contracts for these requirements are expected in July. Quoted prices are being firmly maintained.

For mill prices see Pittsburg report. Freight to Chicago, 18 cents. We quote for shipment from local stocks as follows:

Tank steel, ¼-inch and heavier, up to 72 inches wide, 1.60c to 1.70c; from 72 inches wide to 96 inches wide, 1.70c to 1.80c; 3/16-inch up to and including 60 inches wide, 1.70c to 1.75c; 72 inches wide, 1.95c to 2c; No. 8 up to 60 inches wide, 1.70c to 1.75c. Flange and head quality, 25c extra.

Sheets.—Other than that there is a brisk demand for new tonnage; that specifications are heavy and that prices are firm, there is nothing of unusual interest to report regarding this market. The local mill is operating to full capacity and has specifications in hand for six to eight weeks' run. Galvanized sheets are stronger and may be advanced in price owing to the increased cost of spelter.

For mill prices, see Pittsburg report. Freight to Chicago, 18 cents. We quote store prices at Chicago as follows:

No. 10, 2c to 2.10c; No. 12, 2.05 to 2.15c; No. 14, 2.10c to 2.20c; No. 16, 2.20c to 2.30c; Nos. 18-20, 2.50c to 2.55c; Nos. 22-24, 2.55c to 2.60c; No. 26, 2.60c to 2.65c; No. 27, 2.65c to 2.70c; No. 28, 2.75c to 2.80c; No. 30, 3.05c; galvanized sheets, Nos. 10 to 16, 3c to 3.10c; Nos. 18 and 20, 3.05c to 3.15c; Nos. 22 to 24, 3.20c to 3.25c; No. 26, 3.40c to 3.45c; No. 27, 3.60c to 3.65c; No. 28, 3.80c to 3.90c; No. 30, 4.20c to 4.50c.

Structural Steel.—The total tonnage closed by the American Bridge Co. in the Chicago territory last week approximates 6,000 tons. On the first day of this week, it had been asked to figure on jobs aggregating 10,320 tons. All told, it is estimated that there are at least 100,000 tons being figured, talked of and pending in this district. Conspicuous among the contracts let last week was the Peoria bridge for the Peoria & Pekin Union railway, 1,900 tons, which went to the McClintic-Marshall Construction Co. The same concern also secured the contract for the Iowa Central bridge across Spoon river, 200 tons. The contract for the city hospitals, San Francisco, 3,500 tons, was taken by the American Bridge Co. The same interest also secured the contract for the iron roof of a new building for the Minnesota State Fair grounds, St. Paul, 150 tons; two, two-span bridges for the Illinois Central, 100 tons, the Borland warehouse, Chicago, 700 tons, and for an addition to Ponchartrain hotel, Detroit, 750 tons. The Wisconsin Bridge Co., Milwaukee, secured a bridge contract from the Colorado & Southern, 150 tons, and the Modern Structural Steel Co., Waukesha, got the Ward-Crosby Co.'s new building, 785 tons. The Chicago, Milwaukee & St. Paul gave to the Riter-Conley Co. the contract for the viaduct across Dominion creek, Mont., 600 tons; to the Milwaukee Bridge Co., for the Bear creek viaduct in Idaho, 500 tons, and to the Pennsylvania Steel Co., the Renslow viaduct in Washington, 800 tons. The Minneapolis Steel & Machinery Co. secured the contract for the Zion Mercantile Association building, Salt Lake City, 320 tons. Miscellaneous business let this week includes 1,075 tons in car sills let by the Hicks Locomotive Works, Chicago Heights, and 67 girders, weighing 120 tons, let by the Grand Crossing Tack Co. There is an active demand for structural shapes from mill and store, and all prices are reported firm.

For mill prices of structural steel, see Pittsburg report. Freight to Chicago is 18 cents. We quote from local jobbers' stocks as follows:

All angles, 3 inches and larger, including 6 inches, $1.60 per 100 pounds; angles over 6 inches, $1.70 per 100 pounds base; beams, 3 to 15 inches, inclusive, $1.60 per 100 pounds base; channels, 3 inches and larger, $1.60 per 100 pounds base.

Rails and Track Supplies.—The apportionment of the Harriman rail contract, announcement regarding which was made a couple of weeks ago, is as follows: Illinois Steel Co., 80,000 tons, 10,000 tons of which will be rolled at Gary; Carnegie Steel Co., 12,000 tons; Tennessee Coal, Iron & R. R. Co., 19,000 tons; Colorado Fuel & Iron Co., 22,000 tons. The total requirements are approximately 150,000 tons. The St. Louis & Southwestern railway has awarded its contract for 17,500 tons of Bessemer rails to the Illinois Steel Co. The Lackawanna Steel Co. has secured the contract from the Sheboygan Light, Power & Railway Co. for 500 tons of 60-pound rails and for 2,400 tons from the Minneapolis, St. Paul & Sault Ste. Marie railroad. The Cambria Steel Co. secured a 1,260-ton rail order from this territory, and has inquiry pending for 1,200 tons. The Illinois Steel Co. also secured miscellaneous orders for an aggregate of 3,000 tons of heavy rails. This company now has on its books, for delivery this year, substantially 500,000 tons of heavy rails, while Gary has about 175,000 tons. The business in light rails and track supplies is very heavy, about 1,000 tons of light rails being booked weekly. Since June 1 the local company has sold an aggregate of 46,000 kegs of spikes and 25,000 kegs of bolts, which is considered a remarkable business in view of the heavy tonnages of these materials already under contract. Its mills are filled up for two months on bolts, but it can give fairly good deliveries on spikes and angle bars.

See Pittsburg report for prices on standard sections. On light rails, Chicago, delivery, we quote as follows:

Light rails, 40 and 45-pound, $26; 30 and 35-pound, $26.75; 16, 20 and 25-pound, $27; 12-pound, $28. In lots of 250 to 500 tons a reduction of 60 cents a ton from these prices is made; lots of 500 tons and up carry a reduction of $1 a ton. Track supplies, f. o. b. Joliet, angle bars, 1.50c to 1.60c; spikes, 1.75c; track bolts, with square nuts, 2.15c to 2.20c; with hexagon nuts, 2.30c to 2.40c; small railroad and square boat spikes, 1.90c base, f. o. b. Chicago.

Merchant Pipe and Boiler Tubes.—

Building operations in this district are providing mills and jobbers with a satisfactory tonnage of pipe, but there is little life to the tube market. There is some railroad buying, but neither this branch nor the jobbing boiler trade is very active. Prices are without change. We quote for lap-welded tubes out of store, 65 off, and for charcoal, 50 off. For mill discounts, see Pittsburg report.

Cast Iron Pipe.—There were no lettings of importance last week. The city of Cincinnati is in the market for 2,500 tons, the contract for which will be awarded on June 23; Auburn, Kans., will let contract June 25 for 700 tons, and Knox, Ind., June 28, for 150 tons. We quote prices as follows: Four-inch water pipe, $27.50; 6 to 14-inch, $26.50; larger sizes, $25.50; gas pipe, $1 a ton higher.

Wire Products.—All indications point to continuous operation of mills during the summer months. There is diminution neither in specifications nor new business, but instead an insistent and continuous demand for material. On barbed and smooth wire, and nails, mills are behind in deliveries, the specifications in hand for these materials rarely dropping below 60 days' output. We quote as follows:

Wire nails, jobbers' carload lots, $1.88; retailers' carload lots, $1.93; retailers, less than carload lots, $2.03; painted barb wire, jobbers' carload lots, $1.88; retailers' carload lots, $1.93, with 30c for galvanizing; plain wire to jobbers in carloads, $1.68; staples, $1.88. Wire rods, Bessemer, $27; open-hearth, $28; chain rods, $27, f. o. b. Pittsburg.

Old Material.—The local market continues almost at a standstill. Consumers will buy little or nothing, except at concessions from prevailing prices: and while in some instances these have been allowed, dealers, generally speaking, are not prone to shade their values. Much faith is placed in the possible demand this fall. Mill stocks will be heavily depleted by that time, and with the increasing demands for finished material it is felt there will then be no trouble obtaining the high prices now asked. Dealers are holding enormous stocks at all their yards in this district, and it is expected that railroads will distribute heavily this summer, making it just a debatable question whether the market will absorb all this tonnage and maintain at the same time the present equilibrium. The Burlington has a new list out for 6,500 tons. We have revised our price list, and quote as follows, gross tons being in the first paragraph:

Old car wheels	15.50 to 15.75
Old iron rails	17.25 to 17.50
Rerolling rails (4 ft. and over)	15.75 to 16.00
Old steel rails (2 ft. and under)	15.25 to 15.50
Light section relayers, 45 lbs. and under subject to inspection	21.00 to 23.00
Relaying rails, subject to inspection	19.00 to 19.50
Frogs, switches and guards	14.50 to 14.75
Heavy melting steel	14.25 to 14.50

We quote, net tons, as follows:

No. 1 R. R. wrought	13.50 to 13.75
No. 2 R. R. wrought	13.00 to 13.25
Knucklers, couplers and springs	13.50 to 13.75
Shafting	15.75 to 16.25
Iron car axles	18.75 to 19.00
Steel car axles	17.75 to 18.00
Dealers' forge No. 1	11.00 to 11.25
Pipes and flues	10.00 to 10.25
No. 1 cast, 150 lbs. and less	13.75 to 14.00
No. 1 mill	7.25 to 7.50
No. 1 Busheling	10.75 to 11.00
Mixed busheling	8.25 to 8.50
No. 1 boiler cut	10.25 to 10.50
Boiler punchings	13.50 to 13.75
Cast borings	6.00 to 6.25
Mixed borings, etc	6.00 to 6.25
Machine shop turnings	8.00 to 8.25
Railroad malleable	12.75 to 13.00
Agricultural malleable	11.25 to 11.75
Stove plate and light cast scrap	11.75 to 12.00
Old iron splice bars	16.50 to 16.75

CLEVELAND.

Weakness of the Lake Strike Shown —Shortage in Labor in Coke Regions.

Office of THE IRON TRADE REVIEW,
Browning Bldg., June 22.

Iron Ore.—The general freight situation on the lakes is quiet. There are more vessels than cargoes offering in both coal and ore trades. This situation proves the inherent weakness of the strike. If more boats than are needed offer when business is slack, many more will offer when a demand exists for tonnage. The Lake Carriers' Association has 300 vessels in commission. It is, of course, expected that trade conditions will greatly improve after July 1. As it is at present, the Steel Corporation is practically taking all of the wild tonnage on the market. Boats are experiencing delay at the Soo, some of the freighters waiting 24 hours to be locked through. Altogether the feeling along the docks is much better than it has been since April. The men are quieter and appear more contented and violence has practically ceased. Sales of ore continue at a fair rate.

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer, we quote as follows: Old range Bessemer, $4.50; Mesabi Bessemer, $4.25; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.50.

Pig Iron.—Very few inquiries have developed during the week, the few being from brokers, to whom furnaces are not anxious to give quotations. In spite of the lull in the buying movement, prices are firmly held. We quote, delivered in Cleveland, as follows:

No. 1 foundry	$16.00 to 16.25
No. 2 foundry	15.50 to 15.75
No. 3 foundry	15.00 to 15.25
No. 2 southern	15.85
Gray forge	14.90 to 15.00
Bessemer	16.00 to 16.15
Lake Superior charcoal	19.00 to 19.50
Jackson Co. 8 per cent silvery	20.05

Coke.—Some inquiries for foundry coke for last half are pending. A scarcity of labor has developed in the coke regions. During the past week some ovens have been idle on account of inability to obtain laborers. Spot furnace coke we quote at $1.50 to $1.65 at the ovens, and on contract, $1.70 to $1.75; for first class Connellsville foundry coke we quote $1.80 to $2 for spot, and on contract, $2 to $2.25.

Finished Materials.—Although business is not as brisk as it was a week or two ago, specifications are being received by most mills at a steady rate. One large company is having some difficulty in filling its contracts for structural material, and has been trying to buy small shapes. The only contract of importance awarded in Cleveland during the week was for the addition to the plant of the Cleveland Foundry Co., which will cost about $100,000. The steel in this building will cost about $25,000.

There is considerable uncertainty as to the operation of the Empire and Union rolling mills after July 1, when the present wage agreement expires. The mills will probably be closed for at least a couple of weeks, and the decision as to whether operation will then be resumed will depend upon the state of the market and the adjustment of the wage schedule.

Old Material.—The market is still quiet, and leading dealers express the opinion that it will be quiet for possibly several weeks. The mills are not buying in anything like appreciable quantities. The railroads in the last week have let go some material, but evidently are not getting as good prices as they have up to this time. We continue to quote these prices unchanged for last week f. o. b. Cleveland, as follows:

Old iron rails	$16.50 to 17.00
Old steel rails (re-rolling)	15.00 to 15.50
Old steel rails (under 6 feet)	15.00 to 15.50
Old car wheels	15.50 to 16.00
Old steel boiler plate	12.50 to 13.00
Mallable iron (railroad)	14.00 to 14.50
Steel axles	18.00 to 18.50
Malleable iron (agricultural)	13.00 to 13.50
Heavy steel	14.25 to 14.75
Country mixed steel	13.00 to 13.50
Low phosphorus	16.00 to 16.50

We quote, net tons, as follows:

No. 1 R. R. wrought	$14.00 to 14.50
No. 1 busheling	12.00 to 12.50
No. 1 machine cast	12.50 to 13.00
Iron axles	17.50 to 18.00
Axle turnings	10.00 to 10.50

Machine shop turnings	8.50 to 9.00
Grate bars	11.00 to 11.50
Pipes and flues	11.50 to 12.00
Tank iron	10.00 to 10.50
Hoop and band iron	9.00 to 9.50
Sheet iron	8.00 to 8.50
Wrought drilling	8.50 to 9.00
Stove plate	11.00 to 11.50
Cast borings	7.50 to 8.00

NEW YORK.

Moderate Sales of Pig Iron—Structural Orders Placed.

Office of THE IRON TRADE REVIEW, 1328 Monadnock Block, June 22.

Pig Iron.—There are some further sales of basic reported here as having taken place during the past week, and together with the buying of pipe interests these about comprise the activity of the market. The pipe manufacturers are buying in such lots as are available, there being a scarcity of low grade irons. The run in foundry grades has been in small lots, totaling about 500 tons a day each for the larger selling interests. Excepting for a rumored advance of 50 cents a ton in southern iron, the market on the whole has been rather featureless. Specifications on contract continue and matters are generally held to be in a healthy condition. Developments in the finished material field are expected to strengthen the market. The Steel Corporation has about 81 per cent of its capacity in blast, which makes a tonnage equal to 86 per cent of last year's capacity. The company's stocks are being maintained at an even level. Some furnace interests which have sold up to their present capacity have practically withdrawn from the market by asking heavy advances in prices. On the whole, the market is strong and prices are stiffer. We quote:

Northern foundry No. 1	$17.00 to 17.50
No. 2X foundry	16.50 to 17.00
No. 2 plain	16.00 to 16.50
No. 2 southern foundry	16.00 to 16.50
Malleable	17.25 to 17.75
Gray forge	15.25 to 15.75

Ferro-Alloys.—There has been less activity in ferro-alloys. Inquiry, however, continues in good amount and the indications are for further buying by the steel companies.

Finished Materials. — Outside of activity in railroad buying, the finished material market has been somewhat quieter during the past week. In all some 22,000 tons of structural were placed, of which the American Bridge Co. took about 8,000 and other interests 14,000. Among the orders were: 3,200 tons, Ray Smelter, Kelvin, Ariz., to the Kansas City Structural Steel Co.; 150 tons, law school, University of California, to the McClintic-Marshall Construction Co.; 2,700 tons, three apartment houses, New York, to A. E. Norton Co.; 620 tons of bridges, Baltimore & Ohio, to McClintic-Marshall; 500 tons of bridges, Salt Lake Route, Llewellyn Iron Works; 4,200 tons, Reading bridges in Philadelphia, to the American Bridge Co. The city of Portland, Ore., is taking bids on a 3,000-ton bridge, and B. Altman & Co. are receiving figures on 2,000 tons for an extension of their store to Madison avenue. The A. P. Smith Mfg. Co., of East Orange, N. J., has taken figures on 400 tons for a new factory building. It is said that the tonnage required for the bridges on the New York, Westchester & Boston electric line will total 20,000. We quote: Angles, 3 to 6 inches x ¼-inch and heavier, 1.46c; beams, 3 to 15 inches, 1.46c; tees, 3 x ¼-inch and heavier, 1.51c; plates, carloads, tank, 1.46c; marine boiler, 1.86c; bar iron, 1.35c to 1.40c; soft steel bars, 1.36c; sheets, No. 28 black, 2.56c.

Cast Iron Pipe.—There have been fewer sales of pipe. Among the takings noted are 1,000 lengths of 8-inch for the city of Yonkers, N. Y., by the United States Cast Iron Pipe Co., and 150 tons of 6-inch for the city of Albany, which went to the Chas. Millar Co., of Utica.

Old Materials.—There has been little change in the market situation and prices remain substantially the same. We quote:

Old steel rails (rerolling)	$13.50 to 14.50
Relaying rails	19.00 to 19.50
Old car wheels	13.00 to 13.50
Old iron car axles	20.00 to 20.50
Old steel car axles	18.00 to 18.50
Heavy melting steel	13.00 to 13.50
No. 1 railroad wrought	15.50 to 16.00
Iron track scrap	13.50 to 14.00
Wrought pipe	12.00 to 12.50
Cast borings	7.50 to 8.00
Wrought turnings	9.00 to 9.50
Heavy cast scrap	12.50 to 13.00
Railroad malleable	11.50 to 12.00
Stove plate	10.00 to 10.50
Grate bars	10.00 to 10.50

CINCINNATI.

Demand for Pig Iron is Light, but Prices are Firmly Maintained.

Office of THE IRON TRADE REVIEW, First National Bank Bulding, June 22.

Pig Iron.—Prices are firmly maintained, although the demand is light and the market quiet. Sales are confined to small tonnages and the aggregate business for the week was moderate. There is an inquiry for 1,000 tons of Bessemer iron for last half delivery from an Indiana concern and for 3,000 to 5,000 tons of Bessemer from a Michigan melter for immediate shipment. A sale of 1,000 tons of No. 4 foundry, July, August and September delivery, at $10.75 Birmingham, was reported; but this was resale iron, and does not represent a furnace quotation. There seems to be nothing under $11.50 Birmingham for No. 2 foundry for prompt shipment or third quarter; and nothing better than $14.50 at furnace for northern iron, No. 2 foundry, or malleable at furnace in the Ironton district. The Wellston furnace has advanced its price to $14.75 for No. 2 foundry and $15 for malleable. The southern producers seem inclined to allow the market to take its course, and are not urgently seeking orders at $11.50 Birmingham and the northern producers seem equally complacent at $14.50 at furnace. Consumers have to a considerable extent covered their wants for the third quarter, and as there is still considerable iron held up and due on uncompleted contracts there is not much reason to expect an urgent inquiry. The position of the southern producers appears to be based upon belief that present prices may be reasonably expected to be maintained through the third quarter, so that but little could be gained by filling order books at present prices; on the other hand, should the market decline, it would be difficult to make deliveries on $11.50 basis contracts. Some of the large southern producers, it will be recalled, refused to take business on the recent decline and there will be undoubtedly a liberal tonnage of unsold southern iron as well as northern available in the third quarter. It is believed that the test of the situation will be made during that period, as it will then develop whether there is sufficient demand to support the market, and, if not, whether producers will have enough confidence in the future to hold their product until consumption improves sufficiently to absorb the supplies without sacrificing values. We quote for prompt shipment and third quarter based on freight rates of $3.25 from Birmingham and $1.20 from Ironton, as follows:

Southern foundry No. 1	$15.25 to 15.50
Southern foundry No. 2	14.75 to 15.00
Southern foundry No. 3	14.25 to 14.50
Southern No. 1 soft	15.25 to 15.50
Southern No. 2 soft	14.75 to 15.00
Southern No. 2 soft	14.50 to 14.75
Southern gray forge	13.50 to 14.00
Northern No. 1 foundry	15.95 to 16.20
Northern No. 2 foundry	15.70
Northern No. 3 foundry	14.95 to 15.20
Jackson county 6 per cent silicon	18.70
Jackson county 8 per cent silicon	19.70
Jackson county 10 per cent silicon	20.70

Finished Material.—Prices are well maintained and the market is steady. There is not much doing in the way of new contracts, but specifications are liberal both from consumers and jobbers. Steel bars continue to be held at $1.25 Pittsburg.

Coke.—A number of contracts are now in force running for a year from

July 1 and some are still under consideration and being closed up. There is only a moderate demand for spot coke, but requisitions on contracts are keeping up fairly well and slightly increasing. The following quotations represent the range of prices in the leading districts. Prompt shipment coke is obtainable at the inside prices but the ovens are asking the outside figures on long time contracts.

	Per Ton.
Wise county furnace coke	$1.60 to 1.85
Wise county foundry coke	2.00 to 2.25
Pocahontas furnace coke	1.65 to 1.85
Pocahontas foundry coke	1.75 to 2.25
Standard Connellsville furnace coke	1.60 to 2.00
Standard Connellsville foundry coke	2.00 to 2.25

Old Material.—There is a strong undertone to the market and the holders are firm in their views. Turnings are the strongest item on the list here and prices are higher. Heavy melting steel is strong and hard to buy at inside prices. We quote dealers' prices here as follows:

Old No. 1 R. R. wrought net tons	$13.50 to 14.00
No. 1 machinery, net tons	13.00 to 13.50
Old iron rails, gross tons	15.50 to 16.50
Old steel rails (re-rolling) gross tons	14.50 to 15.00
Old short lengths, gross tons	14.00 to 14.50
Old iron axles, net tons	17.00 to 17.50
Heavy melting scrap, gross tons	13.25 to 14.00
Stove plate, net tons	11.00 to 11.50
Heavy turnings, net	10.00 to 10.50
Cast borings, net tons	7.50 to 8.00
Car wheels	14.50 to 15.00

PHILADELPHIA.

Heavy Inquiry for Pipe Iron—Some Sales of Basic.

June 22.

Pig Iron.—There have been no further heavy sales of basic during the past week, though some moderate tonnages are reported to have been taken for fourth quarter delivery at $15.50. The furnaces generally hold to the full price and one large interest which has about all the orders it can comforably take care of is asking $16. A small tonnage of low phosphorus was sold to a western interest at $20. Inquiry for pipe iron is heavy and sales aggregating several thousand tons were made during the week on the basis of $15.25. Some 3,000 tons of this was southern iron, which went to a Virginia interest. There is a continued demand for foundry grades in lots of from 25 to 500 tons, the aggregate of which shows a fairly healthy condition of the trade. The orders of one selling interest for the week totaled over 3,000 tons of such business. Some of the sales made were for New England delivery and brought prices ranging from $16.75 to $17.25. One spot sale in New England was at $17.75. Some of the furnace companies expect to blow in additional stacks during July and August, as they feel confident the demand will continue and likely increase. There has been a fair demand for Virginia irons in small lots for delivery over the next quarter. Prices remain practically unchanged and are considered strong in view of the fact that some of the larger interests, which are pretty well sold up to capacity, are asking advances. We quote for delivery, eastern Pennsylvania, during the third quarter as follows:

No. 1X foundry	$17.00 to 17.50
No. 2X foundry	16.50 to 17.00
No. 2 plain	16.00 to 16.50
Standard gray forge	15.25 to 15.75
Basic	15.50
Low phosphorus	19.00 to 20.00
No. 2 Birmingham	15.75 to 16.25
No. 2X Virginia	16.75 to 17.25
No. 2 plain Virginia	16.25 to 16.75

Finished Materials.—The finished material market in the aggregate has gained somewhat in tonnage, though no notable orders have been placed. The heaviest demand is for structural. Prices are firmer and the advances which have recently been asked by some of the mills are held to. The Pennsylvania Steel Co. has practically withdrawn from the billet market. There has been a greater activity in refined bar iron. Prices generally are well maintained. We quote: Structural shapes, 1.45c to 1.55c; plates, 1.45c to 1.55c; sheets No. 28, 2.80c; steel bars, 1.35c to 1.45c; refined bar iron, 1.45c to 1.50c.

Old Materials.—There has been less activity in scrap, though some fair tonnages have been taken by the steel company at $16. Inquiry is heavy and dealers are buying for future delivery. Prices remain unchanged. We quote:

Old steel rails (re-rolling)	$16.75 to 17.25
No. 1 steel scrap	15.75 to 16.25
Old steel axles	20.50 to 21.00
Old iron axles	23.00 to 23.50
Old iron rails	20.00 to 20.50
Old car wheels	15.50 to 16.00
Choice scrap R. R. No. 1 wrought	18.00 to 18.50
No. 1 yard scrap	16.50 to 17.00
Machinery scrap	15.00 to 15.50
Low phosphorus scrap	19.50 to 20.00
Wrought iron pipe	15.50 to 16.00
No. 1 forge fire scrap	13.00 to 13.50
No. 2 forge fire scrap, ordinary	9.50 to 10.00
Wrought turnings	12.50 to 13.00
Axle turnings, heavy	13.00 to 13.50
Cast borings	11.00 to 11.50
Stove plates	13.00 to 13.50

BUFFALO.

Pig Iron Prices Somewhat Stronger—Good Structural Business.

Office of THE IRON TRADE REVIEW,
932 Ellicott Square, June 22.

Pig Iron.—The movement in pig iron is holding up and the market is stiffening somewhat without changing prices, which, however, have not advanced as rapidly as some interests anticipated, although the indications are still as strong that prices will be advanced before long. There is a good call for tonnage for early delivery. Little valley or southern iron has been offered at this point this week. Prices on the tonnage offered were $12 f. o. b. Birmingham and $15.25 at valley furnaces. No. 2X foundry in this district sells at $14.75 to $15.25 f. o. b. Buffalo. There has been an increased call for malleable Bessemer and several western New York interests are now said to be looking for tonnage in 3,000 to 4,000-ton lots. Foundries in this territory are running light with the exception of one or two interests that took contracts without figuring profit to enable them to run at full capacity. These instances, however, are rare. We quote f. o. b. Buffalo for third quarter delivery as follows:

No. 1X foundry	$15.25 to 15.75
No. 2X foundry	14.75 to 15.25
No. 2 plain	14.50 to 15.00
No. 3X foundry	14.25 to 14.75
Malleable Bessemer	15.00 to 15.50
Gray forge	14.25 to 14.75
Charcoal	19.50 to 20.50

Finished Products.—The tone of this market continues good, but there is impending quietness due to the approach of the summer season. Advanced prices made on certain materials has not lessened the demand. Closings for the past week were for small tonnage, but totaled a good average. The Carnegie Steel Co. closed with Canadian consumers for 3,000 tons of structural. Tomorrow it is expected here that the specifications will be out for 800 tons of fabricated structural for the car repair shops of the Delaware, Lackawanna & Western railroad at Buffalo. Other large contracts are in sight, but specifications have not been produced. The plans for the W. H. Granger building will likely be out this week. There appears to be increased business in materials affected by the higher prices and lighter specifications on old contracts at this time.

ST. LOUIS.

Some Expectation of Getting $12 for Pig Iron Before Long.

June 21.

Pig Iron.—While some furnaces are still quoting a price of $11.50 for No. 2, Birmingham, most of the producers are holding out for an advance of 50 cents. Prices now range from $12 to $12.50 for No. 2, Birmingham, the higher figure for shipment over the last quarter of the year, with still some iron to be had at $12 for delivery over the entire last half. The market is stronger, however, and dealers in the St. Louis territory expect that $12 will be the minimum

before long. Buying continued last week at a fair rate, one dealer reporting sales of between 1,200 and 1,500 tons running over all deliveries. No orders for large tonnage were reported. Inquiries are coming in satisfactorily for all deliveries. Our quotations, delivered, to which the freight of $3.75 from Birmingham has been added, follow:

No. 1 southern	$15.75 to 16.25
No. 2 southern	15.25 to 15.75
No. 3 southern	14.75 to 15.25
No. 4 southern	14.25 to 14.75

Coke.—The market is firm at $2.15 to $2.25 ovens for the best-selected 72-hour Connellsville foundry coke for spot shipment, with $2.25 to $2.40 asked for deliveries over the last half on contract. Most of the ovens are reported to have withdrawn their prices for shipment over the first half of next year. Orders aggregating 2,000 tons have been placed within the last few days, for all deliveries. Connellsville 48-hour furnace coke has not changed in price, remaining at $1.75 to $2 for shipment over the remainder of the year and at $1.50 to $1.75 for high sulphur grades. These prices are f. o. b. ovens. The price has not changed on Virginia and West Virgina coke. The freight to East St. Louis and St. Louis is $2.80, and $2.70 from the Virginia fields when shipment is destined beyond St. Louis.

Old Material.—Quotations on scrap iron remain firm as follows:

Cast iron borings, free from foreign material, net tons	$ 5.00 to 5.50
Steel axle turnings, gross tons	10.00 to 11.00
Steel railroad axles, net tons	16.50 to 17.00
Iron railroad axles, net tons	17.50 to 18.50
Miscellaneous steel scrap, gross tons	9.00 to 11.00
Old car wheels, gross tons	14.50 to 15.00
No. 1 railroad cast scrap, net tons	11.00 to 11.50
Heavy machinery cast, net tons	12.00 to 12.50
Stove plate and light cast, net tons	10.00 to 10.50
Sheet iron, net tons, uncut	4.00 to 5.00
No. 1 railroad wrought, net tons	12.00 to 13.00
Railroad malleable, net tons	12.00 to 12.50
Heavy melting steel, net tons	11.00 to 12.00
Relaying rails, net tons	17.00 to 18.00

BIRMINGHAM, ALA.

Receivership for Woodstock Iron Co. Will Probably be Temporary.

June 21.

There is a feeling of confidence in the Birmingham iron market that everything is going to come out all right and that there is going to be a better demand for pig iron, steel and other products in the very near future. The make is being held down to some extent. The demand is equal to the make, with a fairly good inquiry being received. A little iron has been shipped again into Pittsburg to be used for fluxing purposes. This incident has been commented on. The Sloss-Sheffield Steel & Iron Co. has one furnace ready for the torch, and by the middle of next month will be ready with the North Birmingham furnace, which is under repairs. President Maben states that as soon as the demand warrants it these iron makers will be put into commission. The Sloss-Sheffield company has five furnaces in operation at present. The Tennessee Coal, Iron & Railroad Co. has two or three furnaces which could be started on very short notice.

Iron is being moved off the furnace yards in this district, but there is quite a quantity still waiting orders. Quotations remain firm at $11.50 per ton, No. 2 foundry, delivery during the next two or three months, with $12 being asked for iron during the latter part of the year and for special analysis product. The manufacturers appear to be anxious to sell only for immediate delivery at present prices.

The appointment of J. M. Barr and W. E. Leake to be receivers for the Woodstock Iron Co. ,of Anniston, Ala., upon a petition of creditors, will be a temporary affair, says J. M. Barr, the president of the company . The concern was a little short on working capital. Work of repairing the furnace at Anniston will be continued and every preparation made to put the product on the market as before.

BRITISH IRON MARKETS.

Pig Iron Quiet, but Prices Do Not Show Weakness.

Office of THE IRON TRADE REVIEW, Prince's Chambers, Corporation St., Birmingham, England, June 12.

There has been a tendency to quietness in the pig iron market this week, which appears to be mainly due to the fact that most consumers have covered their requirements. But there is no weakness in prices, as was shown by the failure of strenuous "bearing" efforts on the Birmingham exchange on Thursday. Several large orders were on offer contingently on slightly lower prices, but smelters declined to give way, and some of these contracts have since been placed. The most cautious are now satisfied that the time has come to buy. The furnaces decline to accept very heavy forward orders. The approach of the end of the quarter discourages buying for immediate requirements, although a good deal of business is passing for July. The stocks in Connal's stores continue to increase, the amount in stock being 225,880 tons. Business was transacted yesterday at 48s 10½d ($11.97), cash, with 49s 1d ($12.02) one month, and 49s 5d ($12.10) three months. The difference is sufficient to show the confidence in the future. Shipments up to June 9 were 36,655 tons, compared with 34,318 to the same date last month. The hematite trade shows a slight increase in strength, the reason apparently being that recent steel reductions have brought good orders to ship builders. Mixed numbers are now 55s 6d ($13.58), representing an increase of about 1 shilling on recent rates. In the North West district, there has been an increase of production, 26 furnaces now being in blast.

GERMAN IRON MARKET.

Large Stocks of Pig Iron and Coke—Prices Held.

Dusseldorf, June 11.—The situation here is worse at present than it has ever been. It cannot be kept secret any longer by producers that the stocks of pig iron and coke have grown so enormously that they amount at present to about 1,000,000 tons of pig iron (hematite, foundry and Thomas pig iron) and to about 10,000,000 tons of coke. Not less than about 3,500,000 tons of coke are kept in stock by the Gelsenkirchener Bergwerks Actien Gesellschaft, our biggest producers of coke and coal. Notwithstanding these enormous stocks, the prices for coke are kept high by the syndicate and although many consumers expect reduced prices towards the autumn, it is not at all certain that the coke prices will become cheaper. Besides, also, the production of coke is kept high, because the coke makers get such good prices for the by-products today that coke, which was previously the principal product of the coke ovens, has become today the by-product. Also the pig iron production is greater than in the last several months. It will not be reduced soon, because works must have the gas, which today is the principal product of the furnace, while pig iron is rather the by-product. The business in pig iron is dull for delivery in 1909, but some contracts have already been made for delivery in 1910 at prices, leaving about 55 marks ($13.10) per 1,000 kilograms (about one ton) for makers net works for best Westfalian hematite. There is scarcely any difference in the prices between hematite, foundry No. 1 and foundry No. 3. The orders for half products, railway material, girders, etc., are so scarce that works have hardly 50 per cent of their capacity in their books. In fact,

the Stahlwerksverband could give to one of the biggest makers in Lorraine last month, i. e., the firm: Les petits fild de Fois de Wendel & Co. such small orders that this firm had to stop its works during the entire past week. Also the export business is far worse than previously, the English and Belgian competition having got far keener.

Money is still very cheap at 3½ per cent, but it has not been able to cause any activity in the building business. The prospects for this year remain very poor, the more because the government is putting fresh taxes on the industry, which will suffer heavily by it.

METAL MARKETS.

CHICAGO.

June 22.

There was little movement in metals this week. Prices are without change, except tin, which is fractionally lower. We quote as follows:

Lake copper, carload lots, 14¼c to 14½c; casting, carload lots, 14c to 14¼c; pig tin, 30¾c to 31c; spelter, 5.50c to 5.75c; pig lead, desilverized, 4.50c to 4.60c in 50-ton lots; corroding, 4.75c to 4.80c in 50-ton lots; car lots, 2½c per 100 pounds higher; sheet zinc, 7c list f. o. b. LaSalle in car lots of 600-pound flasks; Cookson's antimony, 10½c to 11c; other grades, 10c.

Old metals have also been quiet, and prices are without change. We quote as follows:

Copper wire, 11¾c to 12c; heavy copper, 11½c to 11¾c; light copper, 10¾c to 11c; heavy red brass, 10¾c to 11c; heavy yellow brass, 8½c; light brass, 6¼c; No. 1 red brass borings, 9c to 9¼c; No. 1 yellow brass borings, 7¾c; brass clippings, 8¼c; tea lead, 3.60c; lead scrap, 3.90c; zinc, 3.60c; tin pipe, 24½c; tin foil, 23c; pewter, 17½c; electrotype plates, free from wood, 4c; electrotype dross, 2.90c; stereotype plates, 4⅛c; stereotype dross, 3c; prime slab zinc dross, $60 per ton.

NEW YORK.

June 22.

Copper.—The persistent decline in the London standard market has discouraged buying on the part of consumers, both here and abroad. Sellers have been trying to make a market by offering concessions from day to day, but so far they have met with but little success. The actual business transacted has been of a negligible quantity, the market for Lake in particular being quite nominal. Lake, 13⅜c to 13⅝c; electrolytic, 13c to 13¼c; casting, 12¾c to 13c.

Tin.—The activity in the London market which we reported last week has somewhat subsided. Trade here is at a standstill. Quotations range around 29¼c.

Lead.—There is a steady business doing in this metal at 4.35c, New York.

Spelter.—The improvement in this metal has made further progress. Large orders are being placed daily, particularly by the galvanizers. The smelters are reluctant to engage themselves very far ahead, for in addition to the proposed tariff and the advancing ore market in Joplin, they have now to contend with labor difficulties. It is reported that a number of plants in Kansas are on dead fire because they have a strike on their hands on account of refusing the demand of their men for a raise in wages. The smelters are assuredly in a bad way. They are face to face with a scarcity of ores and the price of spelter does not leave sufficient margin as against the current price of ore. The import lists show constant importations of foreign spelter on an increasing scale, which it is understood is being used for drawback purposes. Prices are firm at 5 2/5c to 5½c, New York.

Antimony.—Sales are only of a retail kind. Prices are nominally unchanged at 8⅜c for Cookson's; 7⅞c for U. S.; 7⅜c and 7⅝c for other brands. Business is waiting a decision on the tariff.

ST. LOUIS.

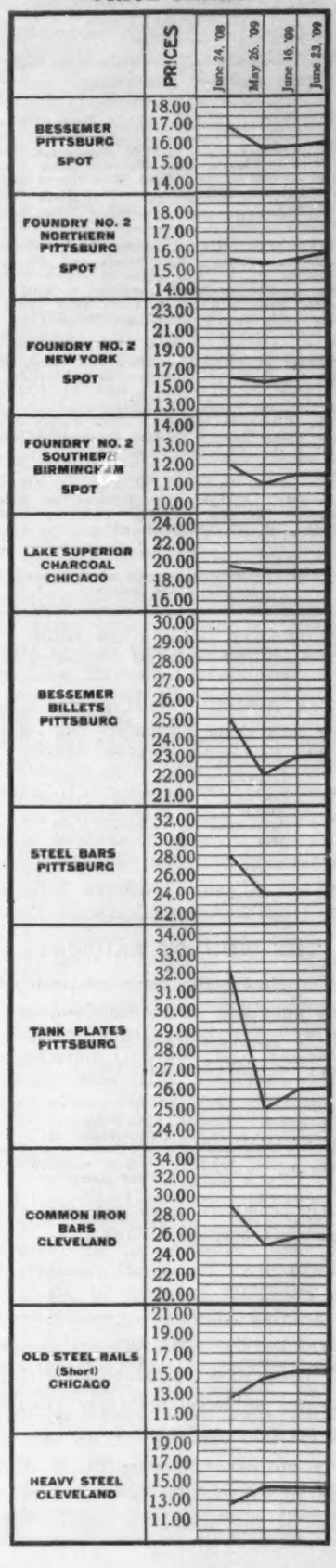
June 21.

Lead and Zinc.—Computing on an assay base price of $44.50 for 60 per cent ore, the highest price paid for zinc ore in the Missouri-Kansas-Oklahoma district last week was $47.50 a ton. The best base price paid was $45, and sales at this figure were more numerous than for the preceding week.

Extra choice grades of blend brought from $44 to $44.50, but the demand was light. The strongest base price was commanded by the lower grades of blend. The Chicago-Joplin interests disposed of several bins at from $44 to $44.50, and the market seemed generally to indicate a strong base price for this week. As a whole, the total value of ores sold was in excess of the average for the year, but the buying was exceptionally light by several large interests. The spelter market at St. Louis closed firm at $5.37½, Saturday.

Lead ore was weaker than during the preceding week. A price of $60 was realized for several bins, but the volume of the ore sold for $59. The quotations on St. Louis pig lead were $4.50. Calamine was strong at from $19 to $22 a ton on a base price of 40 per cent ore.

PRICE CHART.



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THE AVERAGE PAID CIRCULATION OF THE IRON TRADE REVIEW FOR THE ISSUES OF THE FOLLOWING MONTHS WAS:

January	5,506
February	5,346
March	5,396
April	5,508
May	5,533

June 24, 1909.

THE WORLD'S RAILWAYS.

The *Archiv fur Eisenbahnwesen* has just published its annual compilation of the world's railway mileage, as follows, for the close of 1907:

Europe	199,385	North America	268,058
Asia	56,294	South America	34,911
Africa	18,519	Australasia	17,700
Old world	274,198	New world	320,669

The world, 594,867 miles.

The compilation in the past four years has been as follows:

1904	550,290
1905	562,783
1906	580,276
1907	594,867

The increase in three years was 44,577 miles, or 8.1 per cent, an average increase of 14,859 miles per year, or 2.6 per cent per year.

In order to illustrate the distribution of railways, it is convenient to compute the number of square miles of territory per mile of railroad as follows:

	Area, square miles.	Railroad, miles.	Square miles, per mile.
Europe	3,797,410	199,385	19.0
Asia	17,074,050	56,294	303.3
Africa	11,521,530	18,519	622.1
North America	9,294,330	268,058	34.7
South America	6,834,563	34,911	195.8
Australasia	2,600,000	17,700	146.9
The world	54,807,420	594,867	92.1

A comparison by area is much more useful than a comparison by population. Statistics of this sort are useful chiefly for taking a look far into the future, and while a comparison by population may be of some interest, population itself varies and therefore constitutes no stable measuring rod. If conditions favor the building of new railroad, they also favor an increase in population, and the latter is likely to follow the building of railroads, not so much so in the case of a country like China as in the case of the South American countries.

Europe, of all the continents, is best served by railways, having a mile of road for every 19 square miles of area. The continent of North America has a mile of railroad for 34.7 square miles of area. The difference is due to the physical geography, as the average climatic conditions are better in Europe than in North America.

The United States, however, which has a physical geography fairly comparable with that of Europe, has a mile of railroad for every 13.26 square miles of territory. The density of railroad in the United States is probably greater than would be assumed without computation. It is equivalent to the country being covered by parallel lines 13.26 miles apart, gridiron fashion, or by parallel lines, and others at right angles, 26.52 miles apart, checker board fashion.

It is interesting to note that in three years, 1904 to 1907, the United States increased its railway mileage by 7.4 per cent, an average of 2.4 per cent per year. The world, as already noted, increased by 8.1 per cent in three years, or at the rate of 2.6 per cent per year. Thus the United States has not increased altogether as rapidly as the world at large. In the early days of railroading the United States gained much more rapidly than the rest of the world, but naturally a point must be reached with any country when the territory is fairly well served and mileage does not need to be increased largely. With a mile of road for every 13 square miles of area it would naturally be supposed that this country has done the heavy end of its work, in the building of new road, and the statistics show that the rest of the world has passed it in percentage of annual increase.

The building of new railroad is of course only the beginning of railroad expenditure. All the well developed railroads have spent, altogether, several times the amounts originally expended in building and opening the lines. The statistics which have been analyzed indicate only the miles of road, making no allowance for second, third or fourth track or for quality and quantity of equipment, terminal facilities, etc.

An example of the increase in equipment, after railroads are built, may be cited from the experience in the United States. Using Poor's statistics, we find that in 1882, per thousand miles of railroad, there were 191 locomotives and 6,548 cars; in 1907, a quarter of a century later, there were 256 locomotives and 9,343 cars per thousand miles of road.

From the facts cited, and others that might be adduced, it is evident that the world's demands for railroad material in the next quarter century are going to be enormous. There are many portions of the globe which will ultimately be entitled to as good railroad facilities as are now enjoyed in the United States. South America doubtless presents the best prospects for any large area. Proportionate to area, the continent now has only one-tenth the railroad mileage of Europe, one-sixth that of North America and one-fifteenth that of the United States. Through its physical geography it is entitled to more railroad than is the North American continent as a whole, and it ought to work up to a position not far from that of the United States in the matter of railroad density.

As a suggestion relative to the

amount of iron and steel involved in railroads, it may be said that, roughly speaking, there are about 45,000,000 tons of rails in use in the steam roads of the United States, about 20,000,000 tons of iron and steel in cars and locomotives and perhaps 10,000,000 tons more in bridges, viaducts and buildings, a grand total of something like 75,000,000 tons for 228,000 miles of road, about 330 tons per mile. These figures are naturally only rough approximations, but they are indicative. The world at large has two and a half times as great a railroad mileage as the United States, and doubtless twice as much iron and steel in use, so that the world has something like 150,000,000 tons of iron and steel engaged in steam railroad transportation. At the rate of increase in the world's railroad mileage shown in the past three years, it would require 27 years to double the mileage, but on account of the improvement of roads after building it is not improbable that the tonnage of iron and steel in use will be doubled in say 15 years.

Inspected Wire Plants.—To inspect the various processes in the manufacture of the products of which they are distributors, about 75 southern hardware jobbers attending the convention of the Southern Hardware Jobbers' Association at Pittsburg, made up a party June 10 that visited several of the important works of the American Steel & Wire Co. in the immediate Pittsburg district. The visitors were escorted about as the guests of the company and particular care was exerted to make their trips entertaining and instructive. Special street cars and taxicabs were provided to convey them to the Rankin works of the company, and the party was here given a full opportunity to witness the manufacture of fencing, nails and wire in all its different phases. The large Donora works of the company was not inspected by reason that it could not be conveniently reached in time to allow the delegates to return for the convention sessions and functions. During the convention a large number of the visiting jobbers also made trips to the Shoenberger plant of the American Steel & Wire Co. located in the city proper, where the well-known Juniata horseshoes are manufactured. The full operations of the several plants provided the guests with a favorable opportunity for seeing the wire industry at its best. W. L. Hirsch, sales manager of the Pittsburg district and L. H. Carlisle, S. L. Neely and R. H. Sproat, of the Pittsburg office, were in personal charge of the trip to the Rankin plant.

STEEL PIPE CONTRACT.

Awarded by City of Baltimore to Pittsburg Valve, Foundry & Construction Co.

Prompted by her disastrous fire of a few years ago, the city of Baltimore has closed a contract for the complete installation of a high pressure fire system. Cast iron pipe has heretofore been largely used for this class of work.

After exhaustive experiments conducted by D. B. Banks, consulting engineer for the city of Baltimore, and Prof. Carpenter of Cornell university, it was decided to use lap welded, open-hearth steel pipe, in conjunction with cast steel fittings and a special flexible pipe joint, all of which were designed to work under a pressure of 300 pounds per square inch and to be tested to 600 pounds per square inch in the ditch. This contract was accordingly awarded to the Pittsburg Valve, Foundry & Construction Co., of Pittsburg.

The Pittsburg concern has already started work on the material and with its excellent equipment and broad experience as erecting pipe fitters will push this work through to an early completion.

The Swasey Observatory.—The cornerstone of the Swasey observatory was laid at Dennison university, Granville, O., June 16, with appropriate ceremonies. The observatory is the gift of Ambrose Swasey, of Warner & Swasey, Cleveland. It will be one of the finest in the country. Occupying a commanding position on College Hill, it will be constructed entirely of white Vermont marble, and equipped with the finest telescope and other astronomical instruments that can be secured.

The Jamison Coal & Coke Co., Pittsburg, has started the construction of 200 additional coke ovens at its No. 4 plant at Crabtree, Pa. The completion of this improvement will give the company a total of 504 ovens at this plant and a grand total of 1,420 ovens at the different works of the company. The new ovens will be of the bee-hive type.

COAL LAND PURCHASE

Will be Followed by the Construction of Extensive Coke Plants.

A large transaction in coal land which carries with it the proposed construction of extensive coke plants has been closed by the Jamison Coal & Coke Co., Pittsburg, in the purchase of 6,850 acres of coal land from the Barrackville Coal & Iron Co. and the Philadelphia & Reading Coal & Iron Co., which is located just west of Fairmount, W. Va. In the financing of the proposition, the Jamison company has obligated itself to expend $650,000 in improvements upon the property during the next year. It is planned to construct a battery of 200 ovens which will be increased later to 500 ovens, and these will be either of the beehive or longitudinal type. The company has acquired sufficient surface land for building the necessary plants. A double shaft is to be sunk at once and this will be located just west of the town of Barrackville.

Coke manufacture is now being carried on in the immediate district. On the adjoining properties, beehive ovens are being operated by the Georges Creek Coal & Iron Co., Baltimore, and the New England Coal & Coke Co., Boston, formerly the Federal Coal & Coke Co. The deposits are primarily of the gas coal variety. The property is provided with good shipping facilities, as it is traversed its entire length by the Baltimore & Ohio railroad and has a frontage on the Monongahela river. The consideration involved in the deal was $1,600,000. H. H. Patterson, Farmers' Bank building, Pittsburg, conducted the negotiations.

The Jones & Laughlin Steel Co. has also just made an extensive purchase of coal land in Washington county, which has been a part of the Pittsburg-Buffalo Co.'s holdings. The tract contains about 5,500 acres and is located within a very short distance of the Marianna plant of the Pittsburg-Buffalo Co. The coal in this district possesses excellent coking qualities and is declared by coal authorities to be the outcropping of a seam similar in quality to that of the old Connellsville basin. The Jones & Laughlin Steel Co. in acquiring this block of coal has increased its holdings to more than 20,000 acres, which will provide greater coke resources for the future operations of the company. No immediate development work is expected to be done on the property.

No. 4 stack of the Carnegie Steel Co. at Sharon began blowing June 17, after an idleness of 18 months.

DISTINGUISHED GUESTS

From Abroad were Honored at Dinner by Judge Gary.

A dinner was given by Judge E. H. Gary, chairman of the United States Steel Corporation, last Saturday night, to a number of his friends in the steel business, to enable them to meet Sir Robert Hadfield, of Sheffield, Eng., past president of the Iron and Steel Institute, and also Dr. Freiherr von Bodenhausen, a member of the firm of Fried. Krupp, at Essen, Germany. Judge Gary well sustained his reputation as a host, won by the series of successes which attended his efforts previously in bringing together the leaders of the country's iron and steel manufacturing enterprises.

In thanking his guests for their presence, Judge Gary, at the conclusion of the dinner, spoke appreciatively of a number of them having come a considerable distance and with some sacrifice of time and comfort to attend, but he believed that they would feel more than repaid in that they had been able to meet the two distinguished gentlemen from Europe who are making brief trips to America. He spoke of the improved conditions of the country's business noted in the past few months and the promising outlook for the future, predicting a gradually increasing measure of prosperity from this time forward. He referred to the manner in which the severe depression of the past two years had been most bravely met by manufacturers—especially those of the iron and steel industry—and added that because they had stood shoulder to shoulder many times in the past few months substantial benefit had accrued the entire country.

Judge Gary's introduction of Sir Robert Hadfield inspired excellent feeling, and the visitor was given a most cordial welcome. Sir Robert spoke of the pleasure it always gave him to visit America, of the country's growth and development, and of the improvement he had noted as well in its metallurgical processes as in the extent of its tremendous production. Reference was made to the fact that his own country had been a pioneer in the field of both chemical and metallurgical research and development. In the course of his interesting address, the speaker aroused enthusiasm by his cordial references to Germany, prompted by the presence of Baron Von Bodenhausen. His declaration that the relations of both countries should be most friendly, and that nothing should ever mar the cordiality of these relations, met applause.

Baron von Bodenhausen, who followed, spoke of the great improvement he had noted in the quality and method of manufacture compared with what he had observed on his previous visit, some years before. He referred to the effort being made in various places to improve the condition and comfort of employes, speaking generally as well as specifically of the progress this country seems to be making. Like Sir Robert Hadfield, he referred feelingly to the desire of all good Germans and of all real leaders in his country for the continuance of the cordial relations that should always exist between the British and German empires. In this he was enthusiastically applauded.

Charles Kirchhoff, editor of *The Iron Age*, spoke of America as being largely an Anglo-Saxon nation, a link in the chain that should bind England and Germany more closely together; that descendents of Germans and descendents of Britons were largely numbered among the leaders of thought and action in the United States. He felt that this should bind these nations more closely together for all time. Addresses were also made by E. C. Felton, W. B. Dickson, E. J. Buffington, James A. Campbell, J. A. Farrell, Joseph G. Butler Jr., G. C. Crawford, and John A. Penton.

The Guests.

Edward Bailey, president of the Central Iron & Steel Co., Harrisburg, Pa.
E. J. Buffington, president of the Illinois Steel Co., Chicago, Ill.
J. G. Butler Jr., president of the Bessemer Pig Iron Association, Youngstown, O.
J. A. Campbell, president of the Youngstown Sheet & Tube Co., Youngstown, O.
E. A. S. Clarke, president of the Lackawanna Steel Co., New York.
E. S. Cook, president of the Warwick Iron & Steel Co., Pottstown, Pa.
G. G. Crawford, president of the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
W. B. Dickson, first vice president of the United States Steel Corporation, New York.
A. C. Dinkey, president of the Carnegie Steel Co., Pittsburg, Pa.
J. A. Farrell, president of the United States Steel Products Export Co., New York.
E. C. Felton, president of the Pennsylvania Steel Co., Philadelphia.
A. F. Huston, president of the Lukens Iron & Steel Co., Coatesville, Pa.
O. W. Hutchinson, president of the Grand Crossing Tack Co., Grand Crossing, Ill.
Archibald Johnston, president of the Bethlehem Steel Co., South Bethlehem, Pa.
D. J. Kerr, second vice president of the United States Steel Corporation, New York.
Willis L. King, vice president of the Jones & Laughlin Steel Co., Pittsburg.
Charles Kirchhoff, editor of *The Iron Age*, New York.
G. G. McMurtry, chairman of the American Sheet & Tin Plate Co., Pittsburg.
W. P. Palmer, president of the American Steel & Wire Co., Cleveland.
E. W. Pargny, president of the American Sheet & Tin Plate Co., Pittsburg.
John A. Penton, managing editor of THE IRON TRADE REVIEW, Cleveland.
George W. Perkins, member of the finance committee, United States Steel Corporation, New York.
Veryl Preston, president of the Eastern Steel Co., New York.
Hon. J. H. Reed, president of the Bessemer & Lake Erie Railroad Co., Pittsburg.
David Reeves, president of the Phoenix Iron Co., Philadelphia.
Wallace Rowe, president of the Pittsburg Steel Co., Pittsburg.
W. B. Schiller, president of the National Tube Co., Pittsburg.
I. M. Scott, president of the LaBelle Iron Works, Steubenville, O.
F. S. Witherbee, New York.
W. P. Worth, president of the Worth Bros. Co., Coatesville, Pa.
F. W. Wood, president of the Maryland Steel Co., Sparrow's Point, Md.
August Ziesing, president of the American Bridge Co., Pittsburg.

The invited guests who did not attend were:

Charles M. Schwab, chairman of the Bethlehem Steel Corporation.
Thomas Lynch, president of the H. C. Frick Coke Co.
Samuel Mather, Cleveland.
Ferdinand W. Roebling, of the Roebling Sons Corporation, Trenton, N. J.
W. A. Rogers, president of the Buffalo & Susquehanna Steel Co.
W. P. Snyder, president of the Shenango Furnace Co.
Powell Stackhouse, president of the Cambria Steel Co.
J. A. Topping, president of the Republic Iron & Steel Co.

Canal Lock Gates.—The independent Bridge Co., North Side, Pittsburg, has secured from the United States government a contract for its canal lock gates to be placed in the Tennessee river at Riverton, Ala., in connection with the work of establishing slack water in that stream. The contract calls for the upper, lower and guard gates of two locks, making 12 gate leaves each 43 x 45 feet. The contract calls for an expenditure of $50,000. This company has recently placed its annealing boxes with the following concerns: McKeesport Tin Plate Co., Phillips Sheet & Tin Plate Co., Follansbee Bros. Co., Zug Iron & Steel Co., Morris & Bailey, Seneca Iron & Steel Co. and Alcana Tin Plate Co., and it is now erecting a steel warehouse for the Gordon-Shapira Co., Pittsburg.

Rebuilding Earlston Furnace.—The Earlston furnace at Everett, Pa., owned by J. E. Thropp, Esq., is to be entirely rebuilt for an output of 300 tons daily. It will be equipped with a Ladd & Baker single skip hoist and a Baker-Neumann distributor of the latest design. This filling arrangement has been very successful, particularly with soft cokes, as it reduces the coke breakage to a minimum, the discharge point of the stock being only 5 feet above the furnace platform. The engineers are Ladd & Baker, Inc., the Real Estate Trust building, Philadelphia.

The Sharon Steel Hoop Co., Sharon, Pa., has notified its employes that beginning July 1, the former wage scale, which was recently reduced by about 10 per cent, will be restored.

NEW ISSUES

HAVE COMPLICATED THE TARIFF SITUATION.

Metal Schedule Not Completed—Chairman Aldrich Defers Consideration of Important Matters.

Washington, D. C., June 21.—Although considerable progress was made upon the tariff revision bill during the past week, so many new issues have been interjected into the consideration of the measure, and side questions brought out by the newly suggested plans for raising revenues by a tax upon the net earnings of corporations, that all speculation as to the date of the final passage of the bill must be revised along with the tariff itself.

Nothing has been done during the week toward completing the remaining features of the metal schedule. The committee on finance has had the contested questions up for consideration, but no progress was made toward a solution of the difficulties. It is possible that these matters will be taken up in the closing days of the consideration of the bill, when the dutiable lists shall be perfected. Members of the committee admit that every effort has been made to induce the committee to submit to the senate the rate of $5 a ton on steel rails. This has not been done for the simple reason that Chairman Aldrich and his associates suspect that this proposition if submitted to the senate, would be defeated and a ragged hole would be torn in the solid wall of the Republican majority which has stood with the finance committee upon the chief features of the bill.

Controverted Clauses.

Note is taken of the fact that Mr. Aldrich has held back to the last moment those features of the bill about which there is the most controversy among the ranks of the Republicans. He was able to hold his majority intact upon the schedules which were most sharply attacked by the downward revisionists, notably the cotton and woolen goods schedules. When it came to the wood pulp and paper duties, and the coal and hides problems, which sharply divide the Republican members of the senate, he deferred action until the other schedules were out of the way. Mr. Aldrich is indifferent as to the result with respect to these controverted questions, as he expects the senate will be obliged to make concessions to the house when these questions are taken up in conference.

Among the remaining question to excite controvery in the senate and divide the Republicans is the proposed duty on coal. The finance committee has practically agreed to a rate of 50 cents a ton on coal, with a readjustment of the wording of the coal paragraph to provide against the importation of certain coal from Nova Scotia under the rates of the bill providing for slack, 15 cents per ton. The rate of 50 cents is a reduction from the 67 cent rate of the present law. The finance committee recommendation, however, is considerably higher than was expected, in view of the action of the house in placing coal on the free list, coupled with a countervailing provision cornering coal imports from Canada. It is certain that a number of the senate Republicans who have supported the finance committee on the higher rates of the senate revision bill, compared with the house bill, will decline to follow the committee on the proposed coal duties.

The Principal Difficulty.

Herein lies the chief difficulty with which Chairman Aldrich and his colleagues of the finance committee have to deal in handling the controverted questions in conference. It is well known that President Taft favors the lower duties of the house bill, and that he is outspokenly committed to the "free raw material" provisions of the bill as it passed the house. The influence of the executive will be exerted, insofar as this may properly be done, to secure an agreement in conference upon the rates of the house bill, as nearly as possible. He has expressed a hope that the conference on the bill will result in an agreement to place iron ore, coal, hides and lumber on the free list.

It will thus be seen that the issues before the senate at this time run directly into the question of what the final details of the bill shall be with respect to these raw material items. The situation is complicated not a little by the fact that the party divisions in the two houses are sharply drawn upon these raw material questions. The house Democrats voted almost solidly for free raw materials. Two-thirds of the senate Democrats committed themselves to the proposition for dutiable materials, and they are expected to stand out for that policy if the senate conferees shall manifest a disposition to yield to the house on these questions. Already there are intimations that the senate conferees will yield on hides, which will bear a duty of 15 per cent, the existing rate, when the senate has completed consideration of the question. Just how many more items the senate will yield upon is not known. Indeed, powerful influences are brought to bear upon the senate to adhere to the duties imposed by that body upon all these socalled raw materials.

Duties on Iron Ore and Coal.

The opinion is freely expressed that the senate will be almost certain to retain duties on iron ore and coal. The victory which the house will obtain, through the efforts of the western men to hold down the rates of duty on lumber, will be all that the senate will be willing to concede in the direction of the reductions in rates made by the house bill. This reduction in lumber and the retention of the high duties on raw wool, and some reduction, but not as much as was expected, upon wood pulp and print paper, and hides on the free list, will be the most important concessions upon the prime causes of the tariff revision movement, which was in large part induced by demands for reductions upon these items.

On the other hand, the senators who will have a part in the conference are asserting with apparent confidence that President Taft will not interfere with the plan for retaining all these materials upon the dutiable list, and that the house will consent, and will express satisfaction with the reductions in duties to be obtained, instead of the absolute transfer of these articles to the free list.

ARTHUR J. DODGE.

FURTHER WAGE ADVANCES.

The Warwick Iron & Steel Co., Pottstown, Pa., posted a notice of an advance of 10 per cent on the wages of employes to take effect June 20. The Harrisburg Pipe & Pipe Bending Works, Harrisburg, Pa., has announced an increase of 10 per cent in wages, to take effect July 1. Puddlers employed by the Glasgow Iron Co. and the George B. Lessig Co. Inc., both of Pottstown, have been granted increases, the puddling rate being raised from $3.50 to $3.75 a ton. Stanley G. Flagg & Co. has also announced a general wage increase of 10 per cent to Pottstown employes. The Thomas Iron Co., Easton, Pa., has announced a similar wage advance.

The directors of the Youngstown Sheet & Tube Co. at their meeting June 15 received a number of encouraging reports from the various officers of the company, and declared a 2 per cent quarterly dividend in cash payable July 1, and at the same time, a stock dividend of $3,000,000 payable on July 1 to all stockholders of record on July 15.

DUPLEX PROCESS

Of Steel Making is Being Tested by Jones & Laughlin Steel Co.

Interesting experiments in steel making are now being carried on at the South Side works, Pittsburg, of the Jones & Laughlin Steel Co. The company is testing out what is known as the duplex process of producing steel with a view of applying it, if practicable, to the South Side plant and possibly to the new Aliquippa works.

The duplex method is in fact a combination of the present standard Bessemer and basic open-hearth processes. The molten pig iron is first placed in a Bessemer converter and subjected to a blast which is continued for about one-half the length of time required in the common Bessemer practice. The partially-prepared steel is then placed in the basic open-hearth furnace and the steel making operation is completed in the usual manner under this process. By means of the double method it is possible to use pig iron, high, within practicable limits, in both silicon and phosphorus. By the Bessemer converter the silicon is reduced to the proper analysis and through the basic open-hearth action, a similar effect is produced upon the phosphorus. In addition to enabling the use for steel-making purposes of pig iron not strictly within the standard Bessemer and basic specifications, it is believed a combination of the two methods may be developed into producing an increased steel tonnage over that turned out by the same equipment working singly.

A principal and most significant reason prompting the experiments is of an economic nature and is based upon a recognition of the declining importance of the Bessemer practice of steel-making. At its South Side works, the Jones & Laughlin Steel Co. has a Bessemer plant of three converters which was originally installed many years ago. Recent additions to the steel-making equipment of the South Side works, have all been of the basic open-hearth order, the company having only recently completed a group of nine Talbot continuous furnaces. It is an effort on the part of the company to insure the continued utility of its Bessemer plant, which in time may lose its importance as a steel-making unit, that has suggested the experiments with the duplex method. The company is going into the testing work very thoroughly and if successful in the results obtained, will likely make use of the process upon an important scale.

The Tennessee Coal, Iron & Railroad Co. has also been employing the duplex process at its Ensley, Ala., plant.

PERSONAL.

Samuel Mather, of Cleveland, has made a gift of $100,000 to Kenyon college, Gambier, O., the fund to be used to increase the salaries of the members of the faculty.

Alvin B. Davis has been appointed Buffalo sales agent for the Cambria Steel Co., to succeed Fred W. Cox, who was recently appointed sales agent in the Philadelphia district.

Quincy Bent, who has been in charge of the blast furnaces at Lebanon, Pa., of the Pennsylvania Steel Co., has been transferred to Sparrows' Point, Md., as assistant to President F. W. Wood, of the Maryland Steel Co. Mr. Bent will be succeeded at Lebanon by Mr. Dutton.

Perry Barker, M. S., former chemist to the Peabody Coal Co., Chicago, and research chemist at the Illinois state engineering experimental station, has been made assistant chemical engineer on the staff of the fuel engineering department of the Arthur D. Little Laboratory of Engineering Chemistry, Boston, Mass.

RAIL SALES.

(Special Telegram.)

New York, June 23.—The Carnegie Steel Co. announces rail sales as follows: Wichita Falls & Northwestern railway, 5,000; Chicago & Alton, 9,000; Iowa Central, 3,000; Minneapolis & St. Louis, 4,300; Erie, 6,000; Chesapeake & Ohio, 4,000; Elgin, Joliet & Eastern, 1,200; Louisiana & Arkansas, 2,700; Missouri Pacific, 35,000. Some of the foregoing are not entirely new. The Carnegie company also announces sales of 19,000 tons to a railroad whose name is withheld.

Two Freighters Ordered.—The Pittsburg Steamship Co. through President Coulby, has closed a contract with the American Ship Building Co. for two freight steamers. The two boats are to be ready for business at the opening of navigation in 1910 and will be built at the Lorain, O., yards. They will be duplicates of the steamships the Dinkey and the Buffington. Each will be 600 feet over all, 580 feet keel, 58 feet beam, 32 feet deep and will have a carrying capacity of 12,000 tons each.

OBITUARY.

John C. Kiefaber, for a number of years a leading manufacturer in Dayton, O., died there June 14. He is survived by a daughter and one son, J. Frank Kiefaber, an officer in the Barney & Smith Car Mfg. Co.

Robert D. Kuhn, for four years manager of the Cleveland office of the Crucible Steel Co., died at Cleveland, June 10, aged 65. He went to Cleveland four years ago from Canton, O., his former home.

James Bennett Forsyth, president and general manager of the Boston Belting Co., died June 11, in Boston, aged 59. In his lifetime he had taken out 50 patents, nearly all of which had to do with rubber manufacturing machinery and processes.

James Rood died at Evanston, Ill., June 17, aged 90. Born at Johnstown, N. Y., he removed to Chicago in 1864, and became interested in the Lake Superior Pig & Iron Ore Co., of which he was vice president from 1878 to 1889. When the company was merged into the Cleveland-Cliffs Iron Co., he retired from active business.

Robert J. Gray, a veteran iron and steel manufacturer of New York City, died June 12, aged 83. Before the civil war he had established a large business in the manufacture of iron and steel, more especially the building of steam engines and boilers. He built several government vessels for use in the civil war.

Samuel Wilson Murray, pioneer in machinery manufacture, died June 16 at Milton, Pa., aged 80. Since 1864 he had been a resident of Milton, and was the founder of Milton Car Works, the Milton Iron Co., and the Milton water works. He was formerly connected with the Portland Locomotive Co., Portland, Me., and with the Baldwin Locomotive Works, Philadelphia.

Frank M. Campbell, manager of the Philadelphia offices of the Jones & Laughlin Steel Co., died June 21 from a self inflicted bullet wound, at Van Wert, O., where he had been visiting. He had been suffering from a nervous break-down, and was on his way west with his wife and three children for a rest. Mr. Campbell had been district sales agent for the Jones & Laughlin Steel Co. in Philadelphia since 1903. He was born in Clinton, Pa., 46 years ago. He was first employed by the Park Steel Co., and later by the Jones & Laughlin Steel Co. He was highly regarded, not only by the officials of the company and his fellow employes, but also throughout the iron and steel trade generally.

GREAT SUCCESS OF CLEVELAND INDUSTRIAL EXPOSITION

People of the Ohio Metropolis Aroused to the Importance of Their Own City's Manufactures—Visitors From Many Parts of the Country Attend—Show Closes With a Surplus in Treasury

The Cleveland Industrial Exposition, which closed June 19, proved to be a success in every way. The original object of the big show was to acquaint the residents of Cleveland and the surrounding territory with the numerous industrial activities of the city. It has done more than this. The overwhelming success of the enterprise has forced attention from all parts of the country, and a permanent exposition building with the industrial exposition an annual event, are the most promising results.

A financial deficit would have occasioned no surprise, but while it is not yet known just what the status is in this regard, a neat surplus is assured, which will in all probability be turned into a fund for the construction of a permanent exposition hall.

Although exhibits were limited to products of Cuyahoga County, the floor space of over 114,000 square feet proved to be insufficient both from the stand point of the exhibitor and of the visitor. There were 250,000 paid admissions in the two weeks. A great deal of praise is due to manufacturers who lent such excellent support and to members of the committee appointed by the Cleveland Chamber of Commerce, who carried through the scheme so successfully.

The Exhibits.

A brief description of the exhibits of the following manufacturers will prove of interest to the readers of THE IRON TRADE REVIEW:

Allyne Brass Foundry Co.

This exhibit consisted entirely of brass, bronze and aluminum castings varying in weight from a half pound to several tons.

American Ball Bearing Co.

The center of interest in this exhibit was an automatic ball gaging machine which measures and assorts balls varying in size by 0.002 of an inch. Ball bearings of many types were shown, from those used on bicycles to those used on the heaviest sort of machinery.

The American Steel & Wire Co.

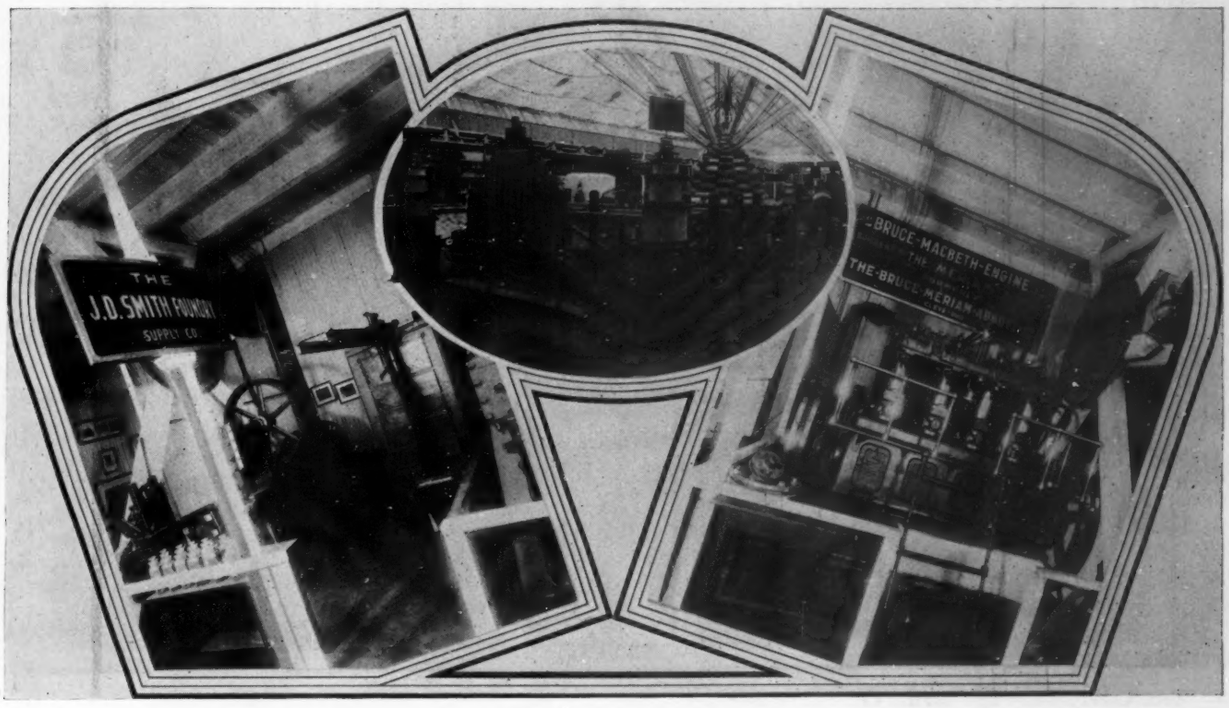
The space taken by this company was the largest taken by any one exhibitor in the exposition hall. The center of the exhibit was a large pyramid built up of coils of wire and other products of this concern. Kegs of nails and boxes of tacks were grouped in very tastefully arranged displays, set off by a background of palms.

Atlas Bolt & Screw Co.

Bolts and screws of all sizes and kinds were shown in assorted display by this concern.

Atlas Car & Mfg. Co.

Several types of mill and mine cars were shown in this exhibit.



THE J. D. SMITH FOUNDRY SUPPLY CO.

THE AMERICAN STEEL & WIRE CO.

THE BRUCE-MACBETH ENGINE CO.

Avery Stamping Co.

This exhibit resembled a small up-to-date hardware store. Cooking utensils, shovels, cream separator bowls and metal stampings of all sorts were shown in generous display.

Bardons & Oliver.

A No. 3 turret lathe in operation, with an automatic air chuck of recent design, a No. 4½ screw machine and a No. 2 turret lathe, were the principal items of interest shown by this concern.

Bartlett & Snow Co.

This exhibit, consisting of a working model of the largest capacity bituminous coal tipple in the world, was a center of attraction. This model required two attendants continually for operation. It represents

the most modern plant of the kind in the world, owned and operated by the Crow's Nest Pass Coal Co., at Michel, B. C., Canada. Canada.

Bishop & Babcock.

A most inviting looking soda fountain with complete equipment was shown. To the intense disappointment of the crowd, this was one of the few exhibits not shown in operation.

Brown Hoisting Machinery Co.

Owing to the nature of the products of this concern, the exhibit was largely photographic. This display attracted considerable interest, however, as nearly 200 photographs

Chase Machine Co.

A line of marine engines, mooring machines, automatic towing machines and steam capstans was shown.

Cleveland City Forge & Iron Co.

This exhibit consisted of several heavy forgings and a display of photographs.

Cleveland Fillet Co.

Displays of wood and leather fillets with pattern letters shown in show cases and on stands made an attractive exhibit.

Cleveland Foundry Co.

An interesting line of Perfection cook stoves and oil heating stoves attracted the housewife.

Cleveland Punch & Shear Works Co.

A motor-driven semi-steel punch and shearing machine with interchangeable attachments for punching and for plate, bar, and angle shearing was shown in operation.

Cleveland Stamping & Tool Co.

This exhibit consisted of a fine line of solid steel seamless hollow ware and enamel ware.

Cleveland Twist Drill Co.

A show case full of assorted drills, reamers and other products of this concern was shown in connection with an artistic model of the company's entire plant. A self-centering drill, to be known as the Paragon drill,

THE CLEVELAND TWIST DRILL CO. THE STRONG, CARLISLE & HAMMOND CO. THE TAYLOR & BOGGIS FOUNDRY CO.

THE WELLMAN-SEAVER-MORGAN CO. THE CHISHOLM & MOORE MFG. CO.

of locomotive cranes, ore bins, ore handling plants and blast furnace tops were shown. In addition, samples of trolleys, ferro-inclave, and a new rotary cleaner for removing scale and rust from structural iron were on exhibit.

Bruce-Macbeth Engine Co.

A vertical four-cylinder, 135-horsepower gas engine was shown in operation.

Chisholm & Moore Mfg. Co.

The boundaries of this display were formed by the hand chains of suspended hoists. A complete line of Cyclone hoists was shown, varying from the ½-ton to a new 30-ton speed hoist. A quarter size working model of the Ludlow track drill machine proved to be of considerable interest, as did also several ammunition hoists of the type used by the United States government.

Cleveland Frog & Crossing Co.

With the floor covered with heavy frogs and switches, and switch and danger signals set up here and there, this exhibit resembled a small section of a switch yard.

Cleveland Furnace Co.

Sections of pig iron and samples of slag with a series of photographs formed this exhibit.

Cleveland Galvanizing Works Co.

Pattern shop and foundry supplies, lightning rods and weather vanes were shown.

Cleveland Hardware Co.

This concern exhibited a line of wagon, automobile and carriage hardware.

Cleveland Planer Works Co.

A "Cleveland" open side planer was shown in operation.

was shown for the first time.

Cleveland Wire Spring Co.

Steel barrels, springs, steel boxes and various other products were displayed under arches formed from coiled springs.

Cyclone Woven Wire Fence Co.

The booth of this concern was constructed of ornamental wire fencing. Tree guards, trellis work, gates, and ornamental wire products of all sorts were shown.

Ferry Cap & Set Screw Co.

The booth was very prettily decorated with flowers and bunting and assorted groups of set screws, machine screws and special screws were shown on display boards and tables.

Foote-Burt Co.

A No. 2 independent feed four-spindle

drill and Nos. 23 and 24 high duty drills were exhibited by this company.

Forest City Steel & Iron Co.

A hand rivet heating forge was shown in operation. Photographs of structural steel work were also on exhibition.

Globe Machine & Stamping Co.

This company's exhibit consisted of a striking display of steel tool and battery boxes for automobiles, brass robe rails, grab handles and foot rests, small and large tumbling barrels, and many-hued specimens of plated and sherardized steel and iron hardware. Much interest was displayed in the sherardizing process which is used to rust-proof iron and steel. The Globe people were the first to establish a commercial sherardizing plant in America.

Hill Clutch Co.

The Smith type of friction clutch was shown in operation, with various kinds of transmission machinery.

Johnston & Jennings Co.

An assortment of gas valves, cast washers, and foundry supplies were shown.

Lincoln Electric Co.

Lincoln motors were shown in operation, with a line of generators and lifting magnets. The quality of the insulation was demonstrated by the operation of one motor under water.

Kirk-Latty Mfg. Co.

This display quickened the pulse of the small boy, whose eyes opened wide as he gazed upon express carts, juvenile automobiles and velocipides galore. The booth was attractively decorated with palms and bunting and the center of display was a bank of bolts and nuts in assorted sizes. Pyramids of carts formed the corners of this exhibit.

Loew Mfg. Co.

A belt-driven No. 0 pipe cutting and threading machine and a No. O4 machine with motor-drive were exhibited with a 25-horsepower marine engine, which this concern has just begun to manufacture.

Lucas Machine Tool Co.

A 15-ton power forcing press, and a No. 1 "Precision," boring, drilling and milling machine were the principal features of this exhibit.

National Acme Mfg. Co.

The new Acme automatic machine No. 515 attracted considerable attention. Passes to its plant were given by the company to those interested.

National Iron & Wire Co.

A model of a steel structure was shown in this exhibit, with a display of photographs of structural work erected by this concern.

Ohio Blower Co.

This concern exhibited Swartout steam and oil separators, exhaust heads and ventilators.

Ohio Ceramic Engineering Co.

A McKelvey concrete mixer of 1/3 yard capacity was shown in operation. There was also a line of concrete buckets.

Osborn Mfg. Co.

Features of this exhibit were the Osborn rockover drop draft molding machine and Sivquick foundry riddle. A general line of foundry supplies was shown.

Price Electric Co.

An excellent line of thermo-electric and resistance pyrometers and heat regulators was shown.

J. D. Smith Foundry Supply Co.

Foundry machinery and general supplies in this line were exhibited.

Standard Tool Co.

A complete line of drills was shown, from the smallest ever made, 0.005 of an inch, to those 5 inches in diameter. One of this concern's latest products, a hot forge twisted drill, was shown.

Standard Welding Co.

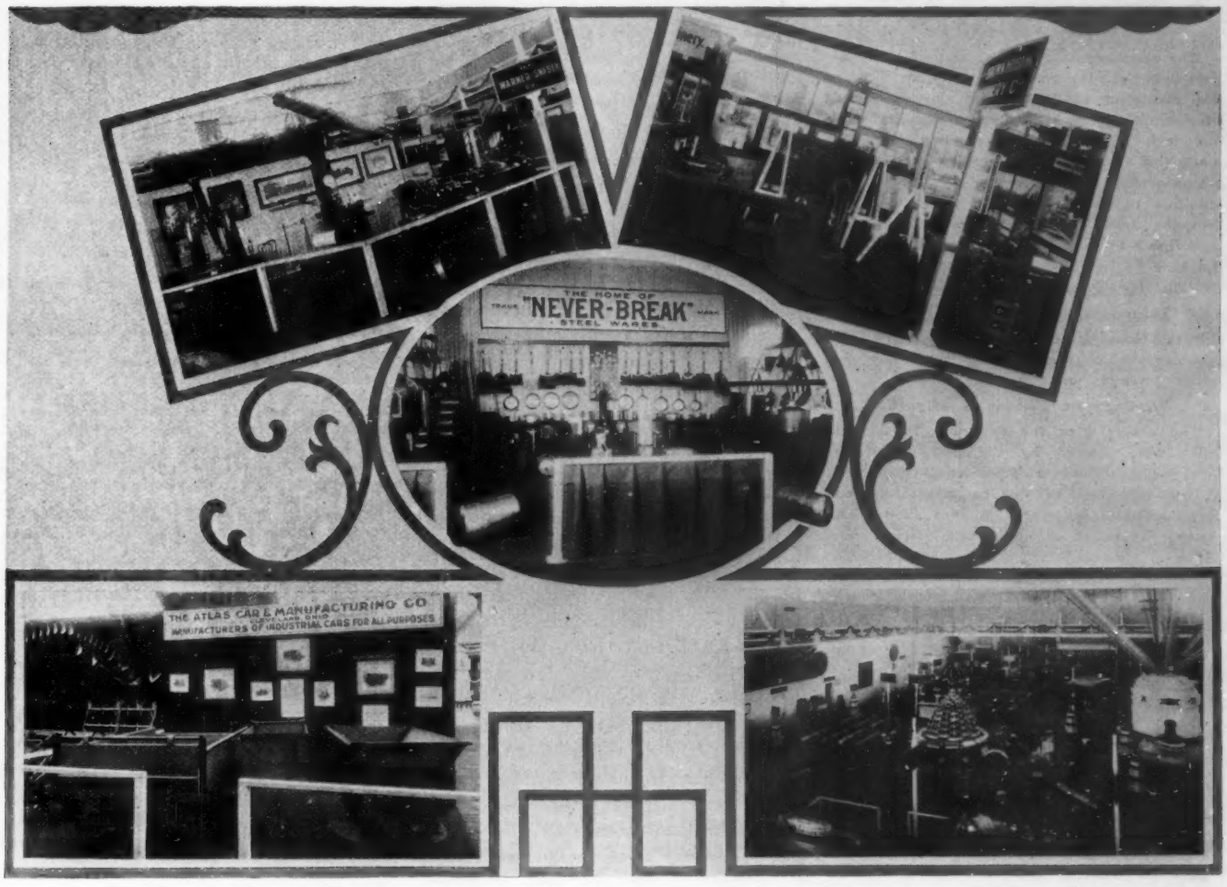
This company's electric welding machine never failed to excite the greatest interest and was the feature of this exhibit. There were also shown samples of seamless tubing, steel rims and rings.

Strong, Carlisle & Hammond Co.

This exhibit consisted of a Frankfort gas furnace in operation, a Strong steam trap and engine stop.

W. S. Tyler Co.

This exhibit of ornamental iron and bronze was one of the most attractive in the hall. The display included a solid bronze elevator



THE WARNER-SWASEY CO. THE AVERY STAMPING CO. THE BROWN HOISTING MACHINERY CO.

THE ATLAS CAR & MFG. CO. THE AMERICAN STEEL & WIRE CO.

inclosure for the Hudson County court house at Jersey City; solid bronze gate for the Cuyahoga County court house, Cleveland; vault shield for Carnegie Safe Deposit Co., New York, and section of railing for the main stairway for the Carnegie Library, Pittsburg.

Superior Foundry Co.

Piano plates formed the chief part of this exhibit, with an assortment of various other castings.

Upson Nut Co.

A display of assorted bolts, nuts and rivets was shown.

Van Dorn Iron Works Co.

This exhibit consisted principally of steel office furniture.

Warner & Swasey Co.

The equipment for the astronomical observatory of Denison University, a gift to the institution by Mr. Swasey, largely formed this exhibit. This equipment consists of a nine-inch equatorial telescope, with auxiliary parts, a four-inch universal transit and chronograph, representing in all $14,000. In addition to this were shown a No. 2 hollow hexagon turret lathe, a 16-inch geared friction head forming lathe, and a No. 1 screw machine.

Wellman-Seaver-Morgan Co.

A working model of the Wellman open-hearth charging machine was shown; also photographs of ore handling machinery and other products of this concern.

Westinghouse Electric & Mfg. Co.

The arches over the entrances to this exhibit were formed by the patterns of the field segments of a 900-kilowatt generator. A standard line of motors, alternating and direct current, for mill duty, was shown with smaller types of machines and electric novelties.

Worden Tool Co.

A fine assortment of machine knives constituted this exhibit.

Wyman & Gordon Co.

This company showed a line of drop forgings of various kinds.

CRUCIBLE BUSINESS IMPROVES.

A steady improvement in the business of the Crucible Steel Co. of America during the last quarter was reported by Chairman DuPuy at a meeting of the board of directors, held at Pittsburg, June 23. A dividend of 1¼ per cent was declared, payable June 30, which is an increase of ¼ per cent over the distribution in the preceding quarter. The statement of earnings of the company for the nine months ending May 1, 1909, is as follows:

First quarter ending Nov. 30, 1908.$	411,212.74
Second quarter ending Feb. 28, 1909	555,823.39
Third quarter ending May 31, 1909	593,343.39
Operating earnings for 9 months.$1,523,379.52	
Reduction in inventory values.....	81,748.25
Net earnings for 9 months.....$1,441,631.27	
Deduct reserve for contingencies..	33,578.58
	$1,408,052.69
Loss for the corresponding 9 months in 1907-08	405,438.93
Increase in earnings in present 9 months $1,813,491.62	

GARY COKE OVENS

Will be Operated Under Koppers System—To Operate July 1, 1910.

The U. S. Steel Corporation has contracted with H. Koppers, of Joliet, for the erection of 560 coke ovens at the Gary plant. The Koppers system has been in use at the Joliet plant of the Illinois Steel Co., and has given such satisfaction that the Gary ovens are to be of the same type with some slight modifications.

To effect a shortening of the ascension pipes the gas will be taken off from one end of the oven. The doors are to be made in the shape of plugs, which will mean a simplification of the brick work on the end of the ovens. Furthermore, only one charging larry will be necessary at the new plant compared to the two which are employed at Joliet.

There will also be an improvement in the coke quenching arrangement. Instead of having the inclined coke bench, the coke will be pushed in a coke quenching car. The ovens will be arranged in eight batteries of 70 ovens. The size of each oven is 37 feet between doors, 17 inches at pusher end, 21 inches at quenching end and 9 feet 10⅜ inches to top of arch. The charge of coal for each oven will be about 13 tons, making a total charge from the complete eight batteries of about 8,000 tons per day and will yield 10¾ tons of coke for each oven, or about 6,500 tons a day. About 50,000,000 cubic feet of surplus gas will be available. The quality of this surplus gas indicated by heat units is 500 B. T. U. per cubic foot. From this it will be seen that the surplus gas recovered from the ovens is equal to a tremendous gas well of natural gas, and will be used as such at Gary. The heat value of the surplus gas is equal to more than 1,000 tons of good quality of coal, and this equivalent is obtained by means of gas from these ovens.

It is proposed to build and put in operation one battery at a time. It is hoped that the first battery will be put in working operation about July 1, 1910, and the whole of the eight batteries are expected to be completed in about two years.

There is also to be installed in connection with this plant the new Koppers process for producing ammonia sulphate direct from the gas. The yield will be about 80 tons per day, and the quality will be superior to that produced in the old system.

MEETING OF THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.

The seventeenth annual meeting of the Society for the Promotion of Engineering Education will be held at Columbia University, New York City, and at Pratt Institute, Brooklyn, N. Y., on Thursday, Friday and Saturday, June 24, 25 and 26, 1909.

The sessions Thursday afternoon and evening will be devoted principally to an address of welcome, reports of officers and an address on "Present Tendencies in Technical Education" by President Frederick E. Turneaure, dean of the University of Wisconsin.

The program for Friday and Saturday is as follows:

FRIDAY, JUNE 25, 10 A. M.

Pratt Institute, Brooklyn, N. Y.

Meeting of the Council at 9:15 o'clock.

Address of welcome, Frederick B. Pratt.

"The Relation of Engineering Education to Industries," by Charles Buxton Going, editor Engineering Magazine.

"Efficiency in Education," by Prof. George F. Swain, Massachusetts Institute of Technology.

"The Extension Work of the University of Wisconsin," by Prof. Louis E. Reber, University of Wisconsin.

Visit to the shops and laboratories of Pratt Institute.

At the close of the program the members of the society will be tendered an informal luncheon by the trustees of Pratt Institute.

FRIDAY, JUNE 25, 3 P. M.

United Engineering Societies Building, Room 2, 29 West Thirty-ninth Street, New York City.

"Report of the Joint Committee on Engineering Education," by Prof. Dugald C. Jackson, chairman.

"The Five Year Courses," by Prof. Charles Derleth Jr., University of California.

"The Five and Six Year Courses in Engineering Schools," by Prof. Robert Fletcher, Dartmouth College.

"The Five Year Courses," by Prof. William T. Magruder, Ohio State University.

"Employer's Requisites of Technical Graduates," by Prof. Hugo Diemer, The Pennsylvania State College.

FRIDAY, JUNE 6:30 P. M.

Banquet at Engineers' Club, followed by roof garden theatre party at 8:15 o'clock and an informal gathering at Hotel Astor, Broadway and Forty-fourth street, at 11 o'clock.

SATURDAY, JUNE 26, 9:30 A. M.

Earl Hall, Columbia University. Business Session and Election of Officers.

"Report of Committee on Graduation," by Prof. John J. Flather, chairman.

"Outline of the New Course in Elementary Physics," by Prof. William S. Franklin, Lehigh University.

"A Summer School in Surveying," by Prof. Charles Derleth Jr., University of California.

"Careers of Graduates of the University of Michigan," by Dean Mortimer E. Cooley, University of Michigan.

"The Requisite Qualifications of an Engineering College Instructor," by Oliver B. Zimmerman, Charles City, Iowa.

SATURDAY, JUNE 26. AFTERNOON AND EVENING.

Parties will be formed to make excursions to points of general and engineering interest on Saturday afternoon and evening.

Jenkins Bros., Bridgewater, Conn., whose mill was burned last fall, will rebuild on the same site. The new mill will be 235 feet long by 70 feet wide, two stories high, with a 50-foot square building, four stories, to be used for a dryhouse. The new mill will employ about 50 hands. The company manufactures leatherboard.

AMONG MACHINERY MAKERS.

CINCINNATI.

Continued Improvement, Especially in Smaller Machines.

Office of THE IRON TRADE REVIEW, First National Bank Bldg., June 22.

There are continued evidences of improvement in the demand for machine tools. The smaller types of machines appear to be enjoying a better demand than the heavier lines. Portable drill concerns are reporting excellent business, with two of the shops running full time without accumulating stock, and one concern behind on orders. One manufacturer of small lathes has had six weeks of good business and is running full time and getting in a nice line of orders. All of the shops do not report such good business as the ones mentioned, so that, while there is an improvement, the demand has not been general enough to furnish sufficient orders to keep all of the shops busy. In planers, trade continues dull and this is accounted for to some extent by the fact that automobile concerns have but little use for a planer, while considerable of the demand for the lighter tools has come from automobile manufacturers. The demand for wood-working machinery is improving. Some of the foundries are now running five heats per week instead of three, indicating an increased demand for castings for machines of all kinds. There is considerable inquiry passing through the offices of all concerns and railroads are beginning to be among the list of prospective buyers. The tone of the market is unquestionably better. Shops which have had but little business during June report the outlook much improved, with the conditions indicating decided improvement by the fall season.

The Cincinnati Ball & Crank Co. is enjoying an excellent demand and is now moving its plant into a larger building at the corner of Sixth and Jane streets. This building was formerly occupied by the J. D. Randall Co., manufacturer of harness machinery. The building is being remodeled for the new occupants.

The Cincinnati Milling Machine Co. continues to be the busiest large plant in this center. The company is behind on orders and finds it impossible to keep up with the incessant calls from agents for deliveries.

The Champion Tool Works Co. is one of the busy shops in the machine tool district and is running practically full time and full force.

INDIANAPOLIS.

Number of New Concerns Organized — Old Plant May Resume.

Indianapolis, June 21.—An exceptionally low price has been obtained by the Indianapolis Union Railway Co. and the city on the structural steel to be used in track elevation work at East Washington street. The contract for the iron has been awarded to the McClintic-Marshall Construction Co., Pittsburg, at 2.05 cents per pound, which, of course, does not include the cost of erecting.

The Midland mill of the United States Steel Corporation at Muncie will be re-opened after having been shut down two years, provided former employes, including rollers, heaters and shearmen, will accept a reduction of 8 per cent of former wages. It is also understood that, if re-opened, the mill will be conducted as an open shop.

The Myers Voting Machine Co. has been organized at Goshen with an authorized capitalization of $20,000. The incorporators and directors are E. L. D. Foster, Bethany A. Myers, Osmer H. Foster, Henry H. Beers and Arthur L. Griffin.

A locomotive ash pan invented by J. A. Schwartz and T. P. Whelan will be manufactured by the Atlas Locomotive Ash Pan Co., just organized at Fort Wayne. The company has an authorized capitalization of $200,000 and will establish a factory immediately.

Another new concern at Fort Wayne is the Fort Wayne Machine Co., which will conduct a retail machinery business and which has $10,000 capital. Those interested in the company are S. Z. Davis, Myrtle M. Davis and Freda L. Jones.

H. B. Heywood, C. A. Matson and G. S. Loomis have organized the H. B. Heywood Co. here and will manufacture a line of machinery, making a specialty of boiler cleaning devices. The company has been incorporated with an authorized capitalization of $25,000.

A general line of machinery will also be manufactured by the Vincennes Machinery Co., which was organized at Vincennes last week by E. A. Ritterskamp, Benjamin Niehaus and C. G. Ritterskamp with $10,000 capital.

The Atlas Engine Works is having an exceptionally good business at the present time, the best it has had since the panic of more than a year ago. Recently the company began turning out gasoline automobile engines, for which it has had a large demand. The company received an order for 800 engines from the Anderson Carriage Mfg. Co.

CLEVELAND.

Small Orders Coming in at a Satisfactory Rate.

Office of THE IRON TRADE REVIEW, Browning Bldg., June 22.

The situation in the machine tool trade in Cleveland remains practically unchanged. No particularly large orders have been booked during the past week, but at the same time small orders are coming in with a satisfying steadiness. Jobbers report a drop in sales in machine tools during the past week among local manufacturers, ascribing this condition to the interest shown in the Industrial Exposition by local machinery dealers at the expense of their own business. Of course a compensating increase is expected in this line immediately, now that the exposition is over. Orders for machinery are being taken in increasing numbers, and manufacturers of automobile parts are especially busy, many of them being behind on orders.

The Pattison Supply Co. reports a consistent demand for machinery. Among orders prepared for shipment during the past week by this concern are a 62-inch boring mill, a Lucas boring mill, a 3,000-pound steam drop hammer, and several consignments of small lathes, planers and shapers.

The Union Engineering Co. is constructing a sand handling plant in the new foundry building of the Ferro Foundry & Machine Co., of this city. The capacity of this plant is five tons of sand per hour.

The Bruce-Macbeth Engine Co. reports the following sales in gas engines during the past week: 135-horsepower engine to the Allyne Brass Foundry Co., Cleveland; 150-horsepower engine to the W. W. Sly Mfg. Co., Cleveland; 150-horsepower engine to the J. D. Smith Foundry Supply Co., Cleveland; 100-horsepower engine to Rudd & Co., Chicago; and 100-

horsepower engine to N. W. Smalzer & Co., New Windsor, Md.

The McMyler Mfg. Co. is about to close a contract for a large coal-handling plant in New Jersey.

PITTSBURG.

Increased Buying by Railroads Improves General Situation.

Office of THE IRON TRADE REVIEW, 510 Park Bldg., June 22.

There is a favorable and sustained movement in machinery lines which has become practically general. The more active interest of the railroads in the making of expenditures is reflecting itself in a better demand for equipment that enters into shop operations. The car building companies in this district are busier than they have been for several years and have much improved prospects for fall trade. The electrical companies report a good inquiry for power plants and are booking an increased volume of orders. Some of the foundries in this territory are getting better patronage and are running heavier melts, but among some jobbing shops the order movement is still of very moderate extent. The machine tool outlook is much more promising and in the heavy machinery lines, as of rolling mill and steel works equipment, there is a satisfactory amount of new business being offered to makers.

The Pittsburg-Buffalo Co. has proposals out for another large expenditure for construction work and equipment in the building of its new model mining town at Marianna, Pa. Contracts will be closed shortly for the purchase of 20 air locomotives and compressors. A steel tipple and machine shop are among the other structures on which bids are asked. Bids have also been asked on the construction of 150 houses for the employes.

The Thompson-Connellsville Coke Co. has let contracts for the erection of 400 additional ovens at its two plants in the lower Connellsville field. This company recently closed a very large contract for coke with the Jones & Laughlin Steel Co. which is to run for a period of three years, and the additional ovens will be required for sufficient production to fill this order, which will begin to be effective toward the latter part of the present year.

The Fidelity Glass Co., which is erecting a new plant at Tarentum, Pa., has recently been awarding some equipment contracts. During the past week, it closed with the Doubleday-Hill Electric Co., Pittsburg, for two 60-kilowatt slow speed generators of the Fairbanks-Morse type, eight motors ranging from 5 to 25 horsepower, switchboard, panels, etc., for its main electric power plant. This will be the first Fairbanks-Morse electric installation in the greater Pittsburg district. The Zug Iron & Steel Co., Pittsburg, also closed in the week with the Doubleday-Hill company for a 25-horsepower motor.

No contracts have yet been awarded by the Republic Iron & Steel Co. for the new four-furnace tube mill which it is planning to erect at Youngstown, O. The drawings are now in process of preparation for this improvement.

The York Bridge Co., York, Pa., has secured the contract for the erection of a new foundry building for the York Mfg. Co. The contract calls for 1,200 tons of structural material and the building will be immediately adjoining the present plant of the York Mfg. Co. The bridge company is also building a new boiler shop at York for Geo. F. Motter & Sons, as well as a bridge at Rozello ferry near Charlotte, Va., and a bridge connecting Berk and Kaboraus counties, N. C.

The Harrisburg Mfg. & Boiler Works, Harrisburg, Pa., has installed a 600-horsepower boiler plant equipped with its new sectional water tube boilers at the J. B. Duke tobacco plant at Raritan, N. J., and has made a 300-horsepower installation at its own plant at Harrisburg. This concern is now working nearly full time and it has several large sized orders for boilers and riveted pipe.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., has been awarded the contract for furnishing the tables for the new 35-inch two-high reversing blooming mill which the Portsmouth Steel Co., Portsmouth, O., will install in its plant.

The Canada Tin Plate & Sheet Steel Co., Morrisburg, Ont., has outlined a program of important improvements to its works which involves the installation of four sheet mills. The American Roll & Foundry Co. of Canton, O., has been awarded the contract for these mills, which will be of the standard 26-inch size.

MILWAUKEE.

Orders Are Coming in Steadily for General Machinery.

Milwaukee, Wis., June 21.—With the Allis-Chalmers Co. setting perhaps the fastest pace in its history, and other large machinery manufacturers of Milwaukee following the pace handily in proportion, the situation in this field is gratifying. May and June business booked by Allis-Chalmers Co. has been at the rate of $25,000,000 a year. It is said that the company is now shipping on an average of one steam turbine and one steam engine every day.

The Vilter Mfg. Co. has orders from all over the United States and even from Japan for refrigerating and ice machinery. Takata & Co., of Tokyo, have purchased a 30-ton ice making plant; the Hammond Packing Co., of Hoboken, N. J., 20 refrigerating machines; American Ice Co., Philadelphia, 150-ton ice making plant and 150-horsepower Corliss engine; Italian Vineyard Co., Los Angeles, 50-ton refrigerating plant. President Theodore Vilter expresses much satisfaction over the improvement of the last two or three weeks and expects it to be maintained.

Ground has been broken for the new foundry of the LaCrosse (Wis.) Plow Co., on Second street, between Vine and Pine streets. The foundry will have ground dimensions of 300 x 75 feet.

The Dornfeld-Kunert Co., of Watertown, Wis., has replaced its stationary steam engine with a 60-horsepower gas producer. The company just a short time ago began the manufacture of the Atkinson gas producer engine and a 10-horsepower engine was installed in its Fifth street shop.

The firm of Holliday & Douglas, machinists, Brodhead, Wis., has been dissolved, Mr. Holliday continuing the machine shop.

WORCESTER, MASS.

Improvement in Business Not Maintained—New Buildings.

Worcester, June 21.—Business hereabout has not kept its upward trend, but is very quiet in some shops. Schooled in patience during the late long depression, our manufacturers feel they can exercise their well-trained waiting ability a while longer, or until real business improvement actually comes.

Samuel E. Elmore has been elected president of the Dwight Slate Machine Co., Hartford, until recently in the hands of a receiver. Charles B. Elmore is vice president and secretary and Martin Welles is treasurer.

Robert Kerr Press Co. is taking over the business of the Robert Kerr Press Works, Stamford, Conn. Capital stock $500,000. The incorporators are Robert Kerr, Arthur F. Kerr and Charles F. Gortner, all of Stamford.

An electrical toy manufacturing concern is being started in New Haven, styled the Lionell Mfg. Co. with $50,000 capital stock. The incorporators are Gustave K. Hartung, Joshua L. Cohen and Victor Scharps, all of New York City.

THE RIEMER HOT-TOP PROCESS OF PREVENTING PIPING IN STEEL INGOTS

By J. F. Springer.

Contraction and Expansion of Metals.

The variation in volume undergone by metals and other substances under the influence of changing temperature is a very familiar fact. As a rule, this expansion and contraction goes on with a great deal of regularity within very considerable temperature ranges. Thus, the co-efficient of the linear expansion of steel being 0.000006 (for 1 degree Fahr.) so confident are metallurgists of the law that the Pennsylvania railroad, for instance, depends upon its validity to insure the final rolling of its rails at a sufficiently low temperature. If the rail is a 100-pound section and is cut to length immediately upon leaving the rolls, it is required to be cut at the length of 33 feet 6½ inches, to produce a 33-foot rail at normal temperatures. If the rail were rolled at too high a temperature, the contraction to normal would amount to so much that a short length would be produced. But this regularity is violently interrupted at one or two points in the total possible range of temperature. This is very conspicuously the case with water. As the temperature decreases, contraction goes on until 4 degrees Cent. is reached, when expansion begins and continues very regularly to 0 degrees Cent. At this point, water passes into the solid state, and this change is accompanied by a very great and sudden expansion; in fact, the instantaneous increase amounts to 7½ degrees—that is to say, at the instant of freezing, water gains by expansion nearly five times as much as the total volume lost in passing from one extreme of the liquid state to the other. Another material which exhibits this same characteristic of suddenly expanding at the moment of solidification—or "freezing"—is gray cast iron. And a similar remark is applicable to type metal. It is because of these properties that both substances may be relied on to fill out their molds in all their details. As to steel, there appears to be considerable doubt whether it, at the very instant of freezing, expands or not. However, it has—perhaps, pretty generally—been assumed that contraction takes place at this moment. And it is on the assumption of this contraction that the phenomenon of piping in steel ingots has been explained.

Piping.

When molten steel has been teemed into an ingot mold and has reached solidification, it will be found upon stripping off the mold that the ingot is not solid from bottom to top. With the exception of a more or less complete possible covering, there exists a considerable axial cavity extending in the form of an inverted cone from the top to a considerable distance down into the body of the ingot. This pit-like depression is not smooth on the sides, nor at all perfect geometrically. But it is none the less a hollow. If the ingot be allowed to cool and is then sawed, or otherwise cut through along its longitudinal axis, the *pipe* is quite apparent, and may extend conspicuously one-third or more of the ingot's length. Upon examining more closely, the steel will often be found to be more or less spongy below the apparent bottom of the pipe, or the pipe may be observed prolonged in a more or less diminished form for a further distance. Just below the bottom of the pipe the segregation is usually—if not always—found. This is a locality in which such constituents as carbon, phosphorus and sulphur are found in a concentrated amount; that is to say, a chemical analysis of the steel at this point will disclose the existence of these constituents at a higher percentage than elsewhere in the ingot. It will readily be seen from the foregoing that if one wishes absolutely sound steel throughout the cross-section of the ingot, all this upper portion will have to be discarded. In fact, in the manufacture of steel for important large uses, it has not been at all uncommon thus to make a discard of one-half the entire ingot. Manifestly this is an enormous loss.

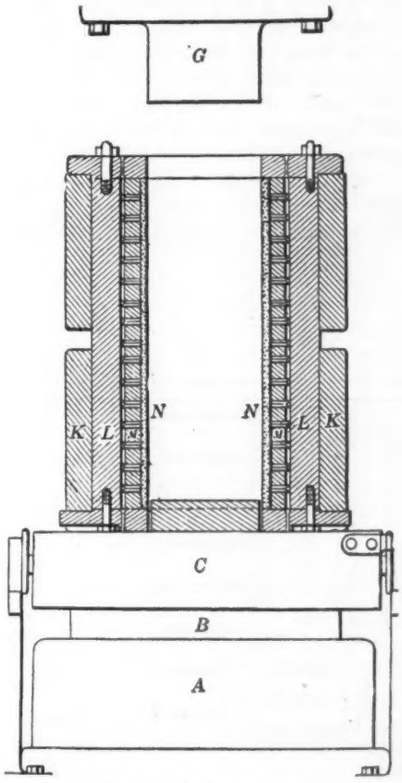


Fig. 1—The Whitworth Process.

But to return to expansion and contraction as applied in explanation of the formation of the pipe. If we assume that there is contraction at the moment of freezing, it is easy to see that an ingot mold that was full before solidification will not be so immediately afterwards. There will thus arise an open space at one or more points. Now at the moment of teeming, the bottom and sides of the mold are many hundreds of degrees cooler than the molten steel. In consequence an external crust will at once be formed, whose dimensions will become comparatively permanent. Within this the molten steel will, when solidified, be insufficient to occupy all the space. Consequently as shell after shell forms—from the outside toward the interior — each containing an amount of fluid steel insufficient when cool to occupy the whole of the interior volume, there will at last be formed a final shell containing no steel at all. This ultimate space is the pipe, and has been thought to represent the amount of contraction. This is, perhaps, a fair statement of the ordinary explanation.

Against this solution of the problem, however, pretty strong reasons may be urged. Thus, Prof. Howe cites the cases of gray cast iron and water. Both expand, instead of contracting, at or near freezing point, and both form pipes. Besides, as he further urges, the size of the pipe in steel ingots is frequently out of all proportion to the certain small amount of the change in volume of steel as it passes from the liquid to the solid state. And so, quite apart from the undecided

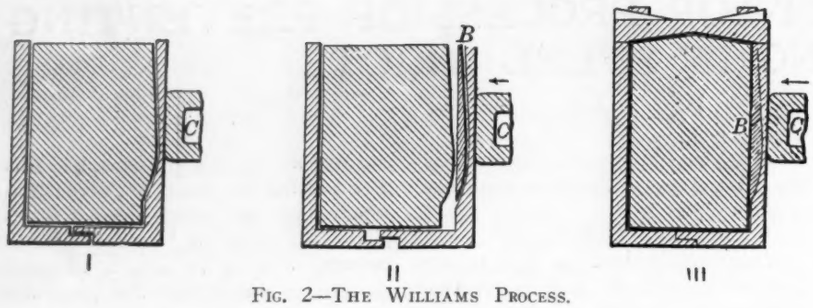


FIG. 2—THE WILLIAMS PROCESS.

question whether steel expands or contracts when freezing, the foregoing explanation of piping seems to be conspicuously inadequate. Even if it contracts, it does not contract enough. And then there are the gray cast iron and water.

Prof. Howe's Explanation of Piping.

In view of difficulties like these, Prof. Howe has offered a different explanation. He relies largely upon contraction, but especially upon that which takes place subsequently to the moment of solidification. He conceives the outer shell to be hindered in this post-solidification contraction by the resistance of the slower cooling and hence slower shrinking interior metal, whether it be entirely liquid or partly liquid and partly solid. This hindered contraction will often result, as cooling goes on, in stretching the outer metal beyond the existing momentary elastic limit which is very low, with the result that the stretch loss of contraction will persist. The effect of this will be that the dimensions of the outside of the cool ingot—as determined by the walls and bottom—will be stretched beyond what they would have been had the shrinking of the outside been unresisted. Now the inner walls of the cooling ingot will, of course, cling to the interior of the outer shell. Consequently, the larger part of the loss by contraction (whether before, during or after freezing) will be internal, and in fact axial. The same explanation which accounts for driving the pipe from the sides of the mold will, of course, account for driving it from the bottom of it. Moreover, gravitation enters here, continually filling in the lower part of the pipe from molten metal above. And so we have the pipe along the axis and at the top of the ingot.

But whatever the explanation and whatever the immediate cause, the *fact* of the piping of steel ingots is undoubted. What aggravates the piping evil is that the larger pipes seem to occur with the grades of more highly carbonized steel. With a very low carbon percentage, the pipe does not seem so serious. In fact, in the old days, when the railroads used iron rails, there was apparently but little trouble from this source. In recent years, however, the carbon percentage has risen from a very low point to one which is considerable. And now we are forever hearing about the pipe. With the makers of large ingots of steel of still higher carbon percentage, the evil is very pronounced. Combined with the segregation, the pipe is a source of enormous loss or enormous menace. If the ingot be resolutely cut away until it is absolutely certain that only sound steel remains, the discard is frightful. If the ingot be only moderately cut, we cannot rely on subsequent manipulations to remove the defects. Thus, it is very certain that the ordinary processes by which ingots are rolled into rails—or structural shapes—are entirely inadequate to eliminate the pipe. And, of course, the chemical constitution of the segregate is unaffected. Whether such methods of rolling as that proposed by James E. York will prove effective in welding the pipe can scarcely be asserted just yet. So that we are restricted in our corrective efforts—for the present at least—to dealing with the freshly cast ingot. The methods that have been applied to this problem may be divided into two classes: (1) those dependent upon mechanical means, and (2) those dependent upon thermal treatment.

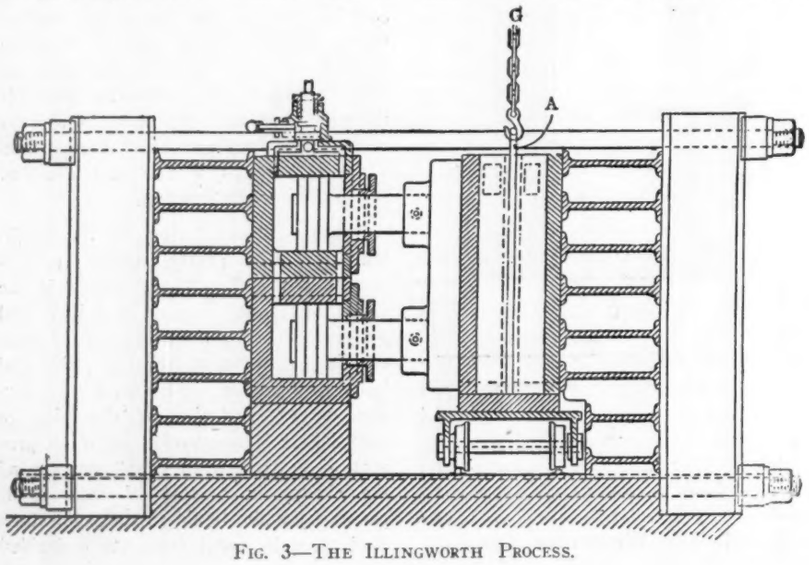


FIG. 3—THE ILLINGWORTH PROCESS.

Mechanical Processes.

The first procedure that would probably occur to one taking up the subject would be to effect some kind of compression. If the pipe is an internal hollow, why not squeeze it out? And so, a number of minds have attacked the problem from this point of view.

The Whitworth Process.

Perhaps the oldest system that has been found at all practicable is the Whitworth process. In accordance with this procedure, the molten liquid is teemed into a mold LL, see Fig. 1, lined with sand NN and lagging of perforated cast iron MM. Strong steel jackets KK reinforce the mold. Above these is a resistance boss G. The mold rests on a platform C which may be given a vertical movement by the hydraulic plunger B operated by means of the compression cylinder A. By forcing the newly cast ingot up against the resistance boss, a longitudinal compression is indirectly effected. This of course, has the tendency of effacing any cavities forming in the body of the ingot. One of the largest steel ingots ever cast was compressed by this system. The mold itself weighed about 180 tons and the molten steel within it about 120 tons more. There are two objections to this system, however. It seems doubtful if gas bubbles have adequate opportunity to escape. And second, the amount of power required to compress an ingot attacked longitudinally, as by this method, must be greatly in excess of the amount actually required to efface the

pipe. However, it seems to be in use, practically, as the great ingot referred to was poured in 1906.

The Williams Process.

However, there have been other attempts directed along lines of less resistance. Thus the Williams procedure made its attack from the side. The ingot when first cast possessed a protuberance on one side near the bottom. This is represented in section in Fig. 2 at the left. The mold was split at the bottom and along two sides to permit a slight lateral withdrawal of the half corresponding to the protuberance. This withdrawal was made when sufficient crust had formed. The indentation on the inside corresponding to the protuberance was then filled up by the introduction of the piece B, see middle view of Fig. 2. By operating the ram C, or other means of exerting pressure, in the direction indicated by the arrow, in the view to the right, the mold could be closed up again with the result of forcing the metal inwards. But this system does not seem to have received any marked consideration.

The Illingworth Process.

The Illingworth system in use at the Jessop Steel Works at Sheffield, Eng., is also a method which operates by fluid compression. Its essentials may be well understood from the vertical section shown in Fig. 3. The car containing a freshly teemed ingot and its mold has just rolled into the hydraulic press. The mold is in two parts, being divided by a vertical plane. This may be better understood from a transverse cross-section shown in Fig. 4. These parts are somewhat separated, at the beginning, by rods having tongues corresponding to the grooves in the neighboring edges of the two halves of the mold. With these rods in place, the molds are practically the ordinary ones of everyday use. But having arrived in the hydraulic press and the walls of the new ingot being sufficiently firm, the rods are withdrawn by the chain and hook G. The ingot is now compressed by operating the plungers seen to the left. It will be noticed that compression is here applied along the entire length simultaneously. In this it contrasts with the Williams process where the compression, although lateral, is from below upwards. The Illingworth system is not to be described as an experimental process, as the Jessop concern is employing it with satisfaction and success.[1]

The Harmet Process.

The compression effected by the celebrated Harmet process is lateral, but is accomplished indirectly by a procedure which has been called "wire drawing." The essentials may be understood from Fig. 5. The mold 27 is reinforced by hoops and is tapered interiorally, the smaller end being above. There is a false bottom 26 resting on a plunger 25. This last is actuated through the car 20 by a hydraulic press below, and not shown in the figure. There is a resistance head 3 to which is communicated through the plate 12 any upward thrust of the mold. This resistance head is, however, not affected directly by the metal in the mold. There is a double-acting piston to whose lower rod 13 a plate is attached. This plate normally rests on the top of the molten ingot in the mold. Compression is effected by operating the hydraulic press below, and so forcing the plunger 25 and the false bottom 26 upwards against the new ingot. As the mold narrows upwards, the effect of this operation is to force the metal radially inwards. It is thus the pipe is closed. Not after it has actually formed, for compression begins at once and continues until solidification has taken place.[2]

This is scarcely "wire drawing," for the reason that the material is forced from the rear. It does, however, pass into an ever narrowing "die." This process has been extensively adopted abroad. Large installations have been made, not only in France, but also in Great Britain and Germany.

From the foregoing it will be seen that mechanical methods have met with considerable success. The Whitworth, Illingworth and Harmet processes have each found practical application. Each has been thoroughly tried out, at least in particular lines of steel manufacture. Whether such systems are applicable to steel rail ingots may well be doubted. Rail ingots are small and the amount of attention that can be bestowed upon each must be inconsiderable, for economic reasons. But inventors have not confined themselves to mechanical methods of correction. They have sought to secure a remedy for the piping evil through various systems in which heat plays a very large part.

Thermal Processes.

A little consideration will show one that gravitation is a real factor in the phenomena attending the formation of the pipe. Because the steel is hot is no reason for the suspension of the influence of gravitative attraction. The main body of the pipe is usually much

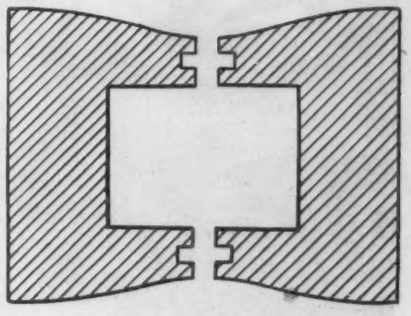


FIG. 4—CROSS-SECTION OF ILLINGWORTH PROCESS.

further from the bottom of the mold than from the sides. This excess is, no doubt, almost entirely due to the effect of molten steel above running down to fill up any cavities which tend to form below. No doubt, the cooling effect of the bottom of the mold also plays a part in the movement

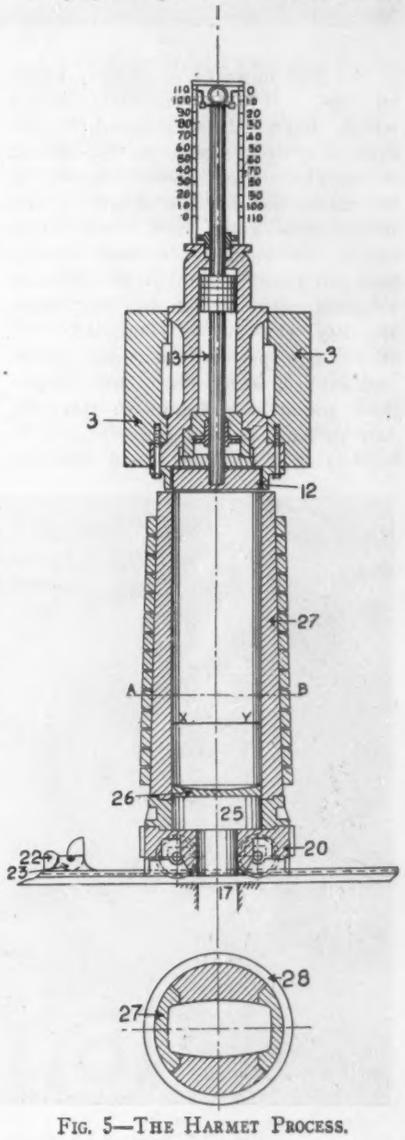


FIG. 5—THE HARMET PROCESS.

[1] See IRON TRADE REVIEW, May 24, 1906.

[2] See IRON TRADE REVIEW, Aug. 22, 1907.

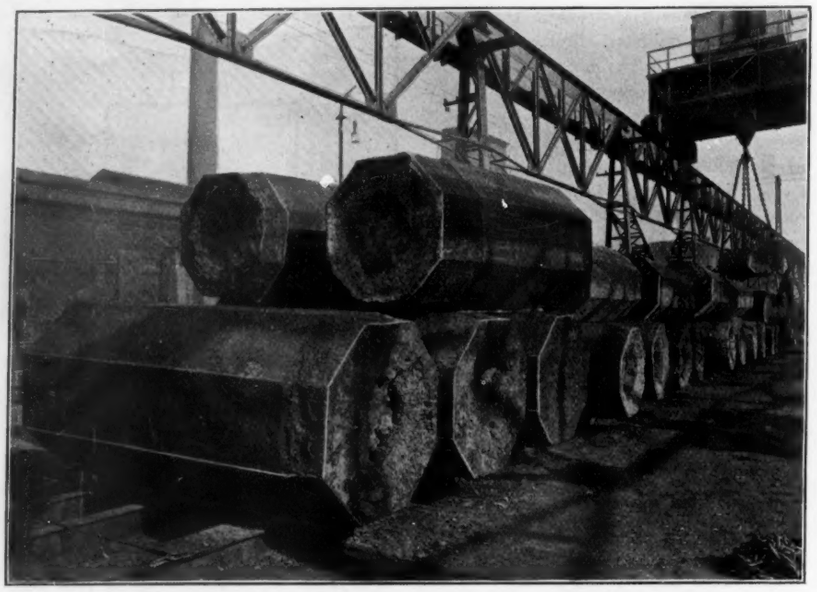


FIG. 6—LARGE INGOTS CAST BY THE RIEMER METHOD. THE SIZE OF THESE INGOTS MAY BE GATHERED FROM COMPARISON WITH MEN IN BACKGROUND.

of the pipe upwards, as already pointed out. If one considers ingots which, having been cropped 50 per cent, are now sound, he is entitled to conclude that some combination of causes has been effective in producing this good steel. And these causes, so valuable in their results, have all been present in the ordinary circumstances of casting the ingot. If they can be disentangled from their non-essential accompaniments and applied, we should be able to produce sound steel ingots in this way, and perhaps economically, too.

Thus it has been found that the simple procedure of casting steel ingots with the large end up is effective in reducing the size of the pipe. Tests have been made along this lne with steel, zinc and wax. And all have uniformly disclosed a corrective influence at work tending to shorten the pipe. It might be thought that that would afford a very simple solution of a very great problem. But it must be borne in mind that while these tests have shown a lessening of the length of the pipe, it still remains. If the upper portion of the ingot be comparatively large, then this short pipe may really affect a body of steel but little different from that affected by the long pipe in an ingot cast with the small end up. And further—there is a very great difficulty if one wishes to apply this procedure to rail ingots. The usual practice at the rail mills, apparently, is to cast the ingots in molds already loaded on small cars. These are then run to a position where the soaking pits are to one side and a train of "empties" to the other side. The heavy mold is lifted off by mechanical means and put in position on the adjacent "empty." The hot ingot is next lifted off and put in the soaking pit. If the big end were up, this economical method of managing the stripping of ingots and placing them in the pits would be seriously interfered with on account of the difficulty of getting the mold off. However, this obstacle does not appear insurmountable, one or two procedures having already been suggested in accordance with which casting with the big end up would seem to be economically practicable.

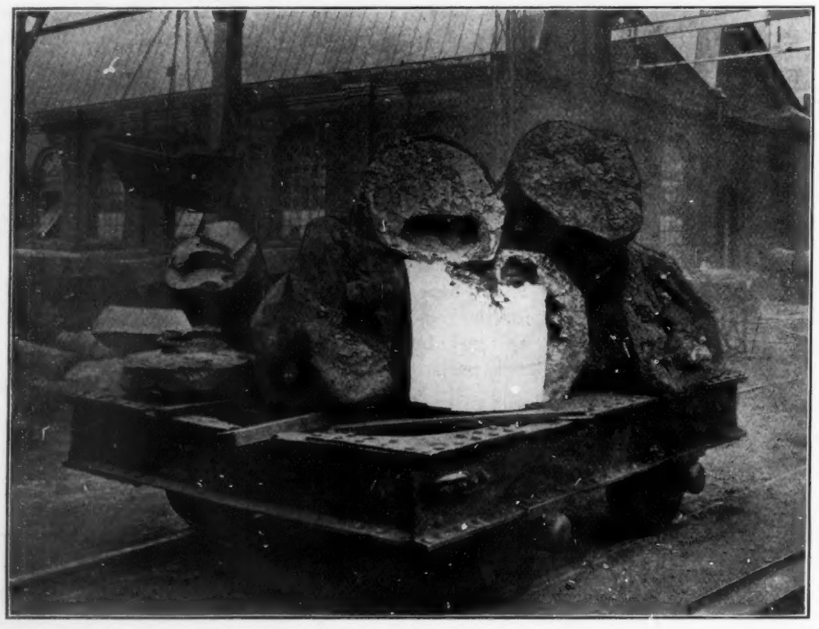


FIG. 7—DISCARDS SHOWING SMALL AMOUNT OF WASTE.

But quite apart from the consummation of all hopes, the effect of this procedure is noteworthy as pointing the way to the causes at work in producing perfect steel. With an ingot of this form there are two notable things. First—a large mass of molten metal cools more slowly than a smaller one. This is, no doubt, largely if not entirely, due to geometrical considerations. Keeping the form the same, the volume of a mass increases as the *cubes* of the dimensions, while its surface increases only as the *squares;* that is to say, the volume increases much faster than the surface. Consequently, the effect of the contracting cool bodies, in other words, the sides of the mold—does not proportionately increase with the volume of the heated metal. And so we must expect a large body to cool more slowly. An ingot cast, then, with the big end up may be expected to cool from the bottom up. Second—in consequence of this, there is, continually, a supply of molten metal where gravitation can act on it to fill in and efface the forming pipe.

The Sauveur Method.

Such considerations as these suggest that perhaps we may secure an ever ready supply of liquid metal in a more economical way than by enlarging the cross-section as we pass up the ingot. And a number of efforts in this direction have been made. Thus by continuing the ingot upwards, reducing the cross-section, but surrounding this "head" with a poor conductor of heat, we shall arrange a supply of liquid material without involving

so great a mass of metal in the pipe which ultimately forms. Experiments have been made along this line, and with some success. What is perhaps a more effective process of accomplishing the same result is the "overflow" method of Prof. Sauveur. In accordance with this procedure, a series of molds are arranged tandem. These are all connected at the top by suitably notching the partitions. By teeming into the first mold, not only it may be filled, but the second and third, and so on for quite a number, the metal overflowing from one to the next. If a considerable number of molds thus connected be arranged tandem, when all the molds that can be teemed from the first have been filled, the process can be continued by passing with the pouring device to the second mold. And so on. It will be seen that this method provides for a considerable time a liquid top to the several ingots. Repeated experiments carried out with small ingots proved very successful. Further experiments, where the carbon was 0.70 per cent and the ingots large, were not prosecuted to a complete elucidation of all obtainable information. So far as these experiments went, however, they appear to have been satisfactory. Prof. Sauveur devised a modification of this method by arranging the several molds in a series of steps, a beaker from the first, which was highest, emptying into the second, and so on. If one arranges an ordinary pitcher upon a flight of low steps with the mouth of one overlapping the opening into the next lower, this system will be well represented. The "overflow" process has been patented, but so far as the writer is aware, it has not been put into active operation.

Howe and Stoughton Experiments.

For upwards of a half century inventors and steel men have been more or less alive to the idea of keeping the top of the ingot hot. Thus Krupp seems to have poured molten slag over the ingot tops. And one has tried one procedure and another another. That this method is effective in reducing the pipe has been well shown in certain experiments of Profs. Howe and Stoughton.[8] These experiments were performed with wax ingots, it is true, nevertheless the wax used is a pipe-forming material, and while the results were not to be regarded as conclusive for steel, they assuredly raise a strong presumption that results would be the same. Two conical ingots were poured, one arranged with the big end up, the other the reverse. The reduction in *length* of pipe was about 63 per cent. But this does not mean, of course, that 63 per cent more of the ingot was preserved from being involved by the pipe. This same experiment has also been tried with steel ingots, the reduction in length of pipe being, apparently, about 50 per cent. In the wax ingots experiments, two were cast in such wise that the one was forced to solidify from the bottom upwards, while the other was "frozen" in the reverse direction. These ingots were not tapered. The difference in pipe was most marked, amounting to nearly one-half the ingot length. In another pair of wax ingots, both were retarded in cooling. But one was solidified from the bottom upwards, the other the reverse. The reduction in pipe in favor of "freezing" from the bottom amounted to about 26 per cent. A further notable case, and one in which gravitation played

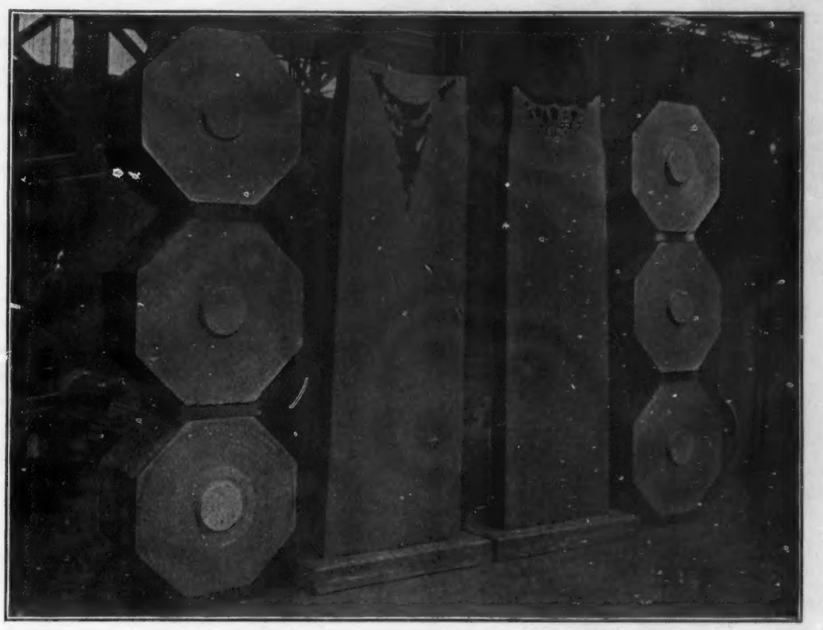


FIG. 8—SIX DISCARDS. SOUNDNESS OF STEEL SEEMS EVIDENT. IN CENTER A RIEMER AND AN ORDINARY INGOT, BOTH SPLIT LENGTHWISE.

FIG. 9—THE FURNACE ON THE HEAD OF THE MOLD.

[8]See IRON TRADE REVIEW, Aug. 8, 1907.

but a secondary part, is that where the conditions on opposite sides were modified. Upon the one side "freezing" was hastened, while upon the other it was retarded. There was a distinct deflection of the pipe in the direction of the retarded side.

In the face of the amount and unanimity of the evidence that has been accumulated on this point, there can scarcely be any doubt that if a supply of sufficiently molten steel is available in a situation where gravitation can operate to feed the forming pipe, it may be largely reduced, if not completely obliterated. There is further evidence in corroboration derived from the use of plumbago and thermit. By the introduction of such substances in the upper part of the freshly cast ingot, a chemical reaction is brought about. It is probably from the great amount of heat thus set free, and the accompanying mass of highly fluid metal, that the reductions in pipe are largely due.

The Riemer Process.

In the Riemer process, to which attention is now especially to be given, this fundamental idea of keeping a supply of highly liquid steel available at the top of the ingot, is followed out with a great deal of completeness and means are devised for its practical realization. Riemer was, however, not the first in the field. Nearly half a century ago, John Ellis in England—as Riemer himself points out—obtained a patent for a device for supplying heat at the upper end of the ingot. The fuel used was gas. This apparatus was to be put in position subsequent to the teeming process. About the same time another arrangement was devised for heating the ingot-head by means of heat applied to a surrounding wall of firebrick. That those processes made no extensive impression upon the practice of ingot casting was, Riemer seems to think, because they were not thorough-going enough. The heat applied was probably far short of what is really necessary to effect striking results, and further, it could scarcely be applied quickly enough after the completion of the pouring. By the Riemer process, heat is applied at once and with great immediate intensity.

The requisite apparatus is neither complicated nor costly. It consists essentially, of a cap or hood which is put in place at the top of the ingot mold before the pouring begins. (See Fig. 9). There is an eye, or link, at the top which facilitates mechanical handling. This hood is let down to a position where the top of the mold envelops the lower portion. The apparatus is, to all intents and purposes, a gas furnace. It is supplied by suitable service pipes with air and producer gas. The air is furnished under pressure, and both gas and air are previously heated. This preheating is a capital feature of this process, and it is thus that an intense heat is quickly obtained in considerable amount. The preheating is accomplished by means of a tubular apparatus. The heat for the ingot is applied by means of thin jets of flame. When the molten steel has filled the mold, these play directly upon the upper surface of the liquid metal. But, in advance of teeming, the contrivance may be used to preheat the upper end of the mold itself. The possibility of placing the furnace in position before pouring is due to the fact that the design is such as to permit teeming through it into the interior of the mold. It is possible by means of this apparatus, to raise the temperature of the steel at the top of the new ingot considerably above the melting point. Riemer regards such a temperature as highly essential. It will be granted that this device permits a great supply of heat to be at once available. It may seem rather unaccountable that stress should be laid upon the great promptness of bringing a large amount of heat to bear. A little consideration will show one, however, that this is perhaps, the only way to prevent the formation of an incipient crust at the top of the molten mass. It might be thought, however, that, even if formed, such a crust could do no harm, as the gas flames might be expected to destroy it at once. No doubt they would destroy its integrity as a crust stretching across the ingot top, but the very quickness with which the heat would break up the crust would probably give rise to an incomplete melting of the whole. The result would be that fragments would drop down into the body of the ingot and perhaps occasion trouble. At any rate, Riemer considers the immediate application of the heat as very necessary.

Simplicity of Apparatus.

An important advantage of this process is that it is not necessary to prolong the treatment unduly. In this respect, it is in marked contrast to the compression procedures. Thus, by the "wire-drawing" method, compression is continued until actual solidification takes place. If the ingot is quite large, this may be a matter of hours. With the Riemer process, it is not necessary to delay so long. While the ingot is completing the latter stages of solidifying, the apparatus thus becomes available for use with other ingots. The ease with which it may be moved from point to point is, obviously, a very considerable advantage. That this system is easy to install, of trifling first cost, and of great flexibility in point of applicability, are points that are, perhaps, sufficiently obvious to require no further elucidation than what is afforded by the foregoing.

But the pipe is not the whole of the evil attendant upon the casting of steel ingots. How about the segregation? Prof. Howe seems to think this is something of which we shall never be entirely rid. Accepting this opinion, the question that remains is: how we may secure its elevation to the highest possible point in the ingot? In connection with the Riemer process, this question of the segregate must be answered satisfactorily, as well as that relating to the pipe, for it would be of little avail to eliminate the cavity of the pipe and nevertheless be forced to cut off a considerable length of the ingot to get rid of the segregate. With regard to this point, the answer should be looked for through actual tests of samples taken from various parts of the ingot.

Results Obtained.

An ingot treated by the Riemer process and weighing about 24 tons was cropped so as to leave about 21 tons. This "crop" was then split along a plane which was vertical when this "crop" was in its original position. It was found that the pipe fell considerably short of penetration through this 12½ per cent portion. In fact, the porous portion was no more than about 7 per cent of the original ingot. Now the segregate has been found to follow the tail of the pipe, lying usually a little below it. Three samples were taken at various depths below the bottom of the pipe. The following table exhibits analyses of these arranged according to the depth below the pipe, the sample nearest the pipe being given first. Below these analyses is given, for purposes of comparison, the analyses of a sample of the liquid steel taken at the time of teeming:

Test	Carbon	Manganese	Sulphur	Phosphorus
1	0.314	0.768	0.019	0.030
2	0.320	0.809	0.016	0.039
3	0.261	0.820	0.011	0.030
Charge	0.229	0.809	0.013	0.027

From the same ingot, off at one side, at about the point where it was cropped, another sample was taken. Also, a fifth was secured from the side, but close to the base of the ingot. The analyses of these were as follows:

Test	Carbon	Manganese	Sulphur	Phosphorus
A	0.235	0.900	0.016	0.023
B	0.230	0.960	0.007	0.018

An example which exhibits strikingly the contrast between the Riemer process and that which is usually followed is afforded by two ingots of about 15 tons each which were cast from the same heat. The piped portion amounted in the one case to scarcely 5 per cent of the weight of the original ingot, while in the other it was more than 0.30 per cent.

An ingot of about 0.25 per cent steel for marine shafts, and cast by the Riemer process, was tested from samples taken along the axis. The following table exhibits these in order, beginning immediately beneath the pipe. The first six were taken at short intervals. This brought the tests to a point somewhat above the center of the original ingot. At about the middle of the remainder of the axis, the next, or seventh, sample was secured, while the last, or eighth, was taken near the bottom:

Test	Carbon	Silicon	Sulphur	Phosphorus	Manganese
1	0.41	0.040	0.160	0.150	0.91
2	0.25	0.060	0.035	0.048	0.90
3	0.23	0.050	0.040	0.046	0.91
4	0.24	0.045	0.040	0.047	0.93
5	0.23	0.040	0.040	0.044	0.91
6	0.25	0.050	0.044	0.046	0.96
7	0.22	0.055	0.036	0.032	0.96
8	0.24	0.050	0.040	0 042	1.01

This was an immense ingot, having had a basal diameter of about a yard and an original length of about ten feet.

The Riemer system is in active operation at the steel works of the large German firm of Haniel & Lueg, Dusseldorf. There it has been successfully applied for a number of years. From these works thousands of shafts of steel treated by the hot-top process have been shipped to England, passing the examination of the Board of Trade, the discard amounting to no more than 10 per cent. In Fig. 6 will be observed quite a number of steel ingots in the stock yard. The characteristic heads of the Riemer ingots will be readily noticed. The size of the blocks of steel in this view may be gathered by comparing the nearby ones with the man to the extreme right. In Fig. 7 is seen a little car loaded with discards from Riemer ingots. The longitudinal section of such a discard seen in the foreground represents a total waste of about 4½ per cent of the weight of the entire ingot. This discard seems absurdly small. In Fig. 8 are shown, in the center, halves of two ingots each of which discloses an axial section. These ingots, when entire, weighed about 15 tons each. The one was cast by the ordinary methods. Its considerable pipe is readily discernible. The other, disclosing a short pipe, was treated by the Riemer hot-top process. To the right and left are seen six transverse sections from a single Riemer ingot. The entire block weighed about 20 tons, and was 3 feet 6 inches in diameter at the base, and 11 feet high. There is apparently no evidence of a want of uniformity of the steel. In Fig. 9 two of the Riemer gas furnaces are seen in actual operation keeping the heads of the ingots in a highly melted condition. At the left is the wall of the furnace which heats the air and gas for use in the apparatus.

Fig. 10 shows a section and outline of the Riemer apparatus.

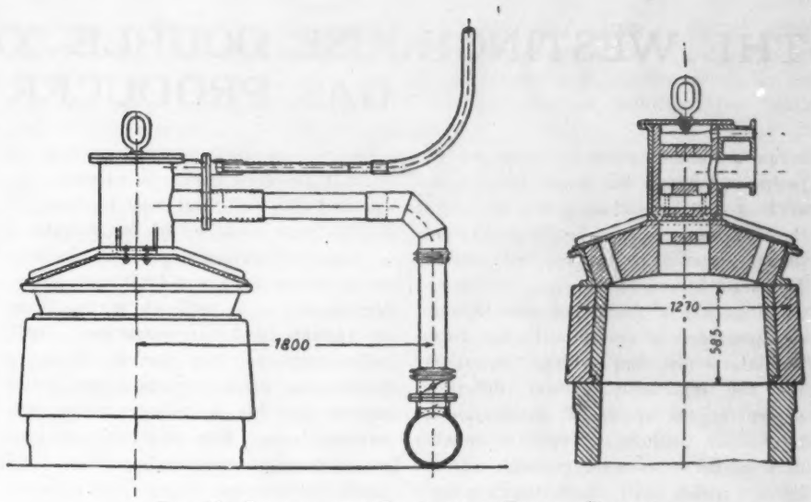


FIG. 10—SECTION AND OUTLINE OF RIEMER PROCESS.

Five Boat Awards.—The navy department has awarded contracts for five torpedo boat destroyers, the bids for which were opened last week. The vessels are for a speed of 29½ knots. These are the successful bidders: The Bath Iron Works, 24 months, $659,500; New York Ship Building Co., 22 months, $548,000; the William Cramp & Sons Ship & Engine Building Co., 24 months, $637,000; the Newport News Shipbuilding Co., 24 months, $629,000; the Fore River Shipbuilding Co., 24 months, $644,000.

The Ashland Iron Mining Co. lighted No. 1 stack at Ashland, Ky., May 25.

Lake Notes.

A. F. Harvey, assistant general manager of the Pittsburg Steamship Co., underwent an operation at Lakeside Hospital, Cleveland, last week, from which he is now rapidly recovering.

The Pittsburg Coal Co., which had the misfortune to lose its new dock at Point aux Frene last year, has decided to concentrate its coaling facilities in St. Marys river at the Sault. The pockets and machinery of the collapsed dock will therefore be moved there.

The American Ship Building Co. has sold the steamer Andrew S. Upson to A. T. Kinney, of Cleveland. This steamer was ordered by R. P. Ranney, of Cleveland, and was launched from the Cleveland yard last March. She was named in honor of the president of the Upson Nut Co., and has already delivered a number of cargoes. She will be operated by the Tecumseh Steamship Co. The American Ship Building Co. is also constructing a 10,000-ton steamer for Mr. Kinney at Lorain, being one of the three steamers recently ordered and reported as building for eastern interests. There has been talk of new lake construction for some months, and it is now reported that additional orders will be announced in the near future.

The Colorado Fuel & Iron Co. blew in another Minnequa stack May 31.

The Detroit Furnace Co. banked its stack May 17, and is still out of blast.

The Norton Iron Works blew out its Ashland, Ky., stack May 31.

The Pennsylvania Steel Co. lighted its No. 3 stack at Steelton, May 4.

The Keystone stack of the Reading Iron Co. was blown out May 31.

Allegheny, Va., stack of the Oriskany Ore & Iron Co., was blown out May 19.

THE WESTINGHOUSE DOUBLE-ZONE BITUMINOUS GAS PRODUCER

For a number of years extensive experimental work has been in progress at East Pittsburg, having for its object the development of a satisfactory producer suited to the use of various forms of bituminous fuels. During the same period a design of non-bituminous producer in several different forms was developed, but without encountering the manifestly greater difficulties present in the successful gasification of bituminous fuels. Although a number of different types were available for the latter, which with sufficient attention could be operated with fair success, the builders adhered steadfastly to a definite standard. This standard involved a producer design capable of (1) continuous operation, (2) producing a gas free from tar, (3) operating at such temperatures as would avoid troublesome clinker formation, (4) producing a gas of normal constituents suited to high engine compression, and (5) finally, a producer that could be readily operated by a single attendant with comparatively little labor and skill. This latter qualification evidently necessitated a plant of the greatest simplicity.

The above-mentioned program of experiments on various types covered an exceedingly wide range in producer design and with full-sized models from 250 to 750 horsepower tested for months at a time. These experiments included many forms of down-draft and underfeed systems, as well as various types of blowers and tar extractors, finally culminating in the present form of double-zone producer, which has proven entirely suitable for the ordinary bituminous fuels. This experimental work was recently concluded with a full year's continuous testing with various fuels and operating conditions, some tests lasting for a month, day and night, without shutting down. All of the results are based on the actual power developed by brake tests of the gas engine.

These performance tests embraced both good and poor coals from the Pittsburg district and lignites from northern Colorado, Texas and South America, with a trial, also, of garbage, crude meadow peat and other waste material. The period of operation ranged from 10 to 24 hours a day throughout the month, generally at full or overload, also a two months' run to determine stand-by losses accurately. It is, therefore, believed that this series of tests constitutes an unusually complete demonstration of the ability of this type to operate continuously and satisfactorily with reasonable grades of bituminous fuels.

Type of Plant: The general scheme will be observed from a sectional drawing showing a complete plant with all auxiliaries. An upper shell, A_1, superimposed upon lower shell, B_1, with cast-iron evaporator, E, between. A hollow air-cooled top, C, communicates with the evaporator through the downcomer, D_1, and the uptake, D_2. A third downcomer connects evaporator E with lower tuyere T. The producer is supported from four concrete foundation piers on a cast-iron mantle, M, the lower rim of which dips beneath the level of the water in the ash pit, forming a water seal.

In the normal operation of this producer, green fuel is fed through the open top, F, and during its descent to the offtake zone, O, is completely transformed into coke. During its further descent to the ash line, S, this coke is completely gasified to ash. There are,

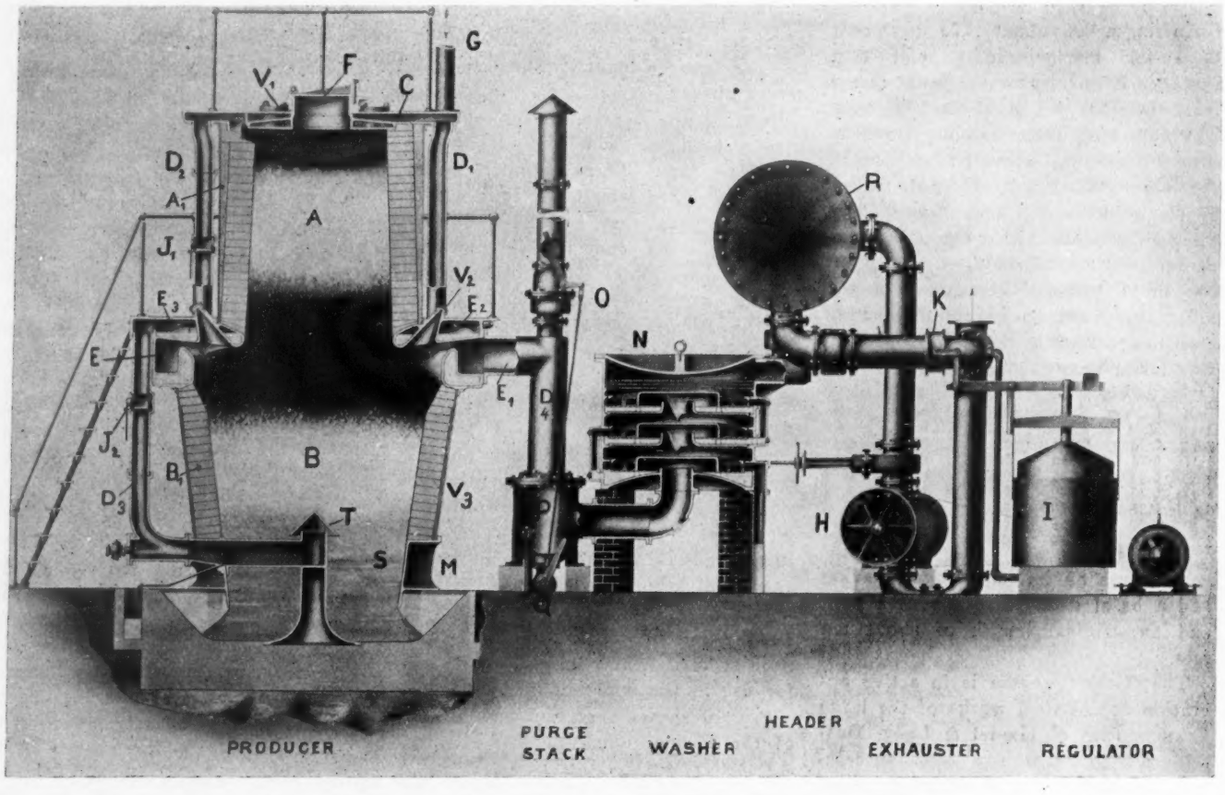


FIG. 1—SECTION OF WESTINGHOUSE DOUBLE ZONE BITUMINOUS PRODUCER.

therefore, two independent fuel beds, *A* and *B*. In the former, tar vapors distilled from the fresh coal are transformed into fixed gas which mixes with the straight coke producer gas generated in the lower zone, *B*.

Vaporizer: It will be observed that there are also two combustion zones in this producer, one at the extreme top and one at the bottom just above the tuyere. This is brought about by a double supply of vapor-laden air. This air supply is drawn in from above at *G*. Circulating entirely around the hollow top, *C*, it is heated sufficiently to increase its capacity for taking up moisture; it is then passed over the surface of the water in the evaporator, *E*. This vaporizer is practically in contact with the hot fuel bed at the center of the producer, where it generates the water vapor necessary for cooling the fuel bed through dissociation. This does away with an external boiler to supply steam to the producer. Entering the vaporizer at E_2, the heated air divides, emerging at E_3, part ascending and part descending. Valves J_1 and J_2 serve to control the relative quantity of blast to the two combustion zones. This relation constitutes practically the only variable in the operation of the plant. It necessarily varies with different kinds of fuels, but for any given fuel it should only be necessary to regulate these valves once. The automatic proportioning of vapor to air is otherwise provided for in the design of the producer, so that the process of gasification is automatic through the entire range of load.

With friable fuels, it is important to reduce the velocity of gas as low as possible at the offtake to prevent fine material being carried over. On this account the gas is drawn from the fuel bed at several points, all communicating with the annulus E_1.

The rotary exhauster, *H*, serves to provide a positive and uniform suction on the fuel bed. This type seemed to best fulfill requirements and incidentally avoid the uncertainties of operation encountered with the hand-regulated blower. Thus, the plant becomes virtually a double-zone suction type. This exhauster, which is motor-driven, operates at a constant speed and delivers gas to the engines always at constant pressure of a few inches of water. This regulation is accomplished by means of a butterfly valve, *K*, and a small gasometer, *I*, which arrangement by-passes such part of the gas delivered by the blower as is not required by the engines, the remainder circulating through a small mixing header, *R*, overhead. In this manner, the necessity for a variable speed exhauster is avoided.

It will also be noted that a gas holder is not employed for the control of gas production as regards quality and quantity or delivery pressure. This reduces the cost of the equipment materially and obviates an exceedingly bulky piece of auxiliary apparatus.

Cleaning: In the absence of tar, the problem of cleaning the gas suitably for engine use resolves itself into the removal of dust and lampblack. This is accomplished by a static cellular-type washer, *N*, in which the gas streams are spread out in thin layers and constrained to pass over the surface of still water, during which process the matter held in suspension is thrown down. This has been shown to reduce the quantity of foreign matter to about 0.02 grain per cubic foot, which affords a very large margin of safety in operation. In practice, a large part of the foreign matter is thrown down in the downcomer, D_4, by the action of a water spray, *R*, passing freely to the overflow without entering the static washer.

Washer: The static washer is practically indestructible and largely self-cleaning, owing to the skimming action at each level. The various sections are readily accessible by lifting off the cover.

Water Seals: At *O* is a single-seated stack valve and at *P* a water seal controlled by plug *Q*, which is normally left open. When the plant is shut down, the closing of valve *Q* floods the water seal, *P*, thus shutting off the rest of the plant, and automatically opens the stack valve, *O*. This water seal also makes it possible to work on the auxiliary while the producer is at stand-by.

The water seal of the producer proper may be partially drained by a rotating valve, *U* (not shown). In its "up" position this valve maintains a

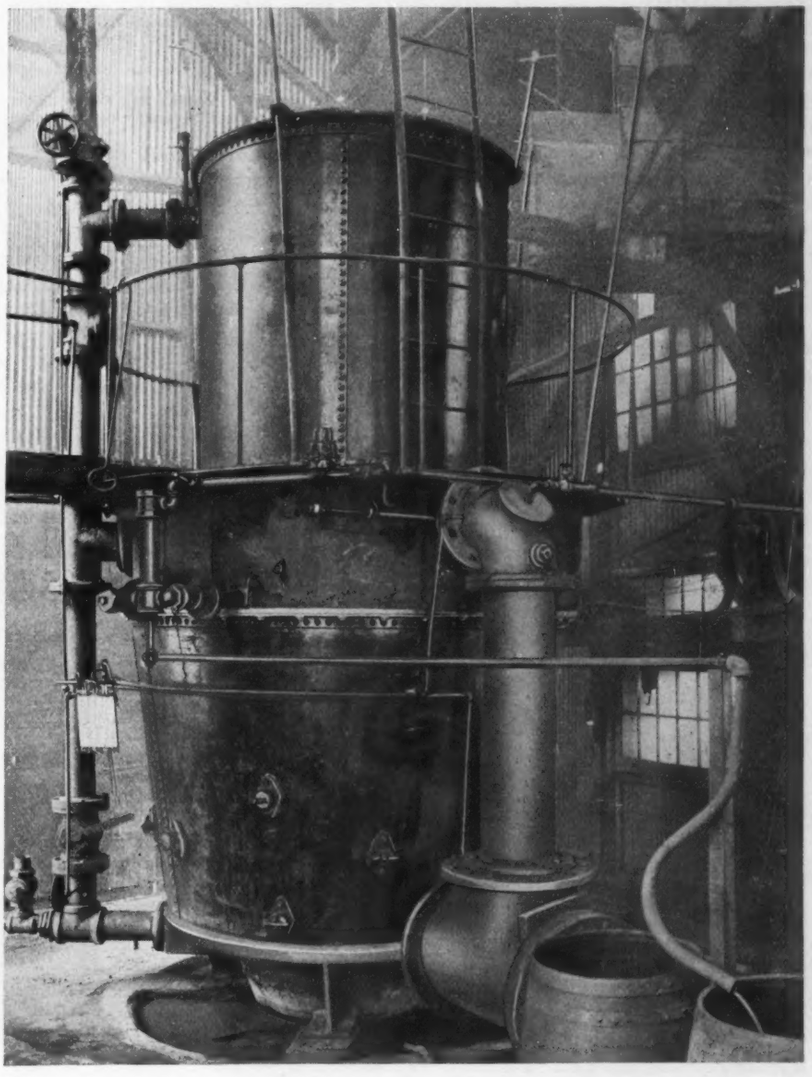


FIG. 2—EXTERIOR VIEW OF WESTINGHOUSE DOUBLE ZONE PRODUCER.

water level, as shown by the dotted line. When turned downward the water is drained 2 inches beneath the lower rim of the mantle ring, *M*, consequently breaking the seal, and allowing free ingress of air at all points. This is effective in the rapid starting of a new fire in which a heavy draft is desirable.

Draft: In normal operation, the pressure at the top fire bed is slightly below atmosphere, so that when the charging cover, *F*, is opened, there is no tendency for smoke or gas to reach the producer room. Thus it occurs that the most important part of the fuel bed is always available for inspection and can be easily worked down in full view. In addition, poke holes, V_1, V_2, V_3, are provided, so located that the sides of both the upper and lower linings may readily be raked by a poker bar and the ash settled down as in the normal operation of a pressure-type producer. These also give access to the fire at these levels—an important feature.

Labor: The labor requirements are comparatively small, as the fuel bed seldom requires loosening more frequently than once per hour. Ashes are removed about once in 24 hours. Thus it occurs that, with coal and ash separately handled, one man can operate at least three of these producers without difficulty. Coal may be charged at intervals of 15 minutes to one hour, according to the load. Owing to the low temperature at which the fuel bed is maintained, the formation of large clinker is entirely prevented, and this trouble has not been encountered in any of the tests. Provision is made for flushing out the vaporizer at intervals to prevent the deposit of mud in case foul water is used.

Operating Results: Reference has been made to various efficiency tests conducted at East Pittsburg. This producer was put under fire in December, 1907. Several weeks' run on Pittsburg run-of-mine at 13,000 B. T. U. per pound as fired gave an average consumption of 1.2 pounds per brake-horsepower-hour continuous operation. After some slight improvements which then appeared to be necessary, the plant was again put into commission on March 31, and from then until April 3, 1909, the fire was never drawn. In the intervening year the following tests have been run with fuels as noted below:

(A) Three 10-hour tests on South American lignite.
(B) Fifteen-day, 24-hour test on Colorado lignite.
(C) Fifteen-day, 24-hour run on Pittsburg run-of-mine. Fifteen-day 10-hour run on Pittsburg run-of-mine. Thirty-day, 24-hour run on Pittsburg run-of-mine.
(D) Ten-day, 10-hour run on Massachusetts meadow peat.
(E) Ten-day, 10-hour run on Texas lignite.
(F) Forty-five-day, 24-hour run at stand-by, Pittsburg run-of-mine.

Average Composition of Fuel.

Runs.	A	B	C	D	E	F
Moisture	20.05	16.63	2.03	38.10	34.09	2.03
Volatile	34.44	33.78	34.98	40.54	30.03	34.98
Fixed carbon	30.85	42.22	56.22	17.86	26.32	56.22
Ash	14.66	7.37	6.77	3.50	9.56	6.77
B. T. U. per pound as fired	8,032.00	8,599.00	13,305.00	6,410.00	6,950.00	13,305.00

Besides the above, there have been numerous short runs under special conditions to determine the various factors entering into successful operation of the producer. The accompanying table shows a summary of the tests on Pittsburg run-of-mine and Colorado lignite.

Coal Consumption: In general, an economy of about 1.1 pounds per brake-horsepower-hour was obtained on ordinary Pittsburg coal with 24-hour operation. With 10-hour operation, including stand-by of 14 hours, the economy approximates 1.25 pounds per brake-horsepower-hour. For lignite the economy averages 1.6 pounds per brake-horsepower-hour continuous service. The stand-by loss, when under proper draft, is extremely light, averaging for a 175-horsepower producer 10 pounds per hour by actual test of a month's duration, and this includes the gas lost by blowing up the fire each morning of stand-by run.

Efficiency: The efficiency of the producer did not vary more than 10 per cent from full load to no load on the plant and approximates 77.5 per cent on total heat value, or 71.5 per cent on effective power value basis. Samples of refuse taken from the producer during the tests on Pittsburg run-of-mine, show the following composition for an average of six samples:

Ash, 85.1 per cent; fixed carbon, 14.9 per cent. As the original coal contained about 7 per cent ash, the actual percentage of combustible wasted was $14.9 \times 7 \div 93 = 1.1$ per cent.

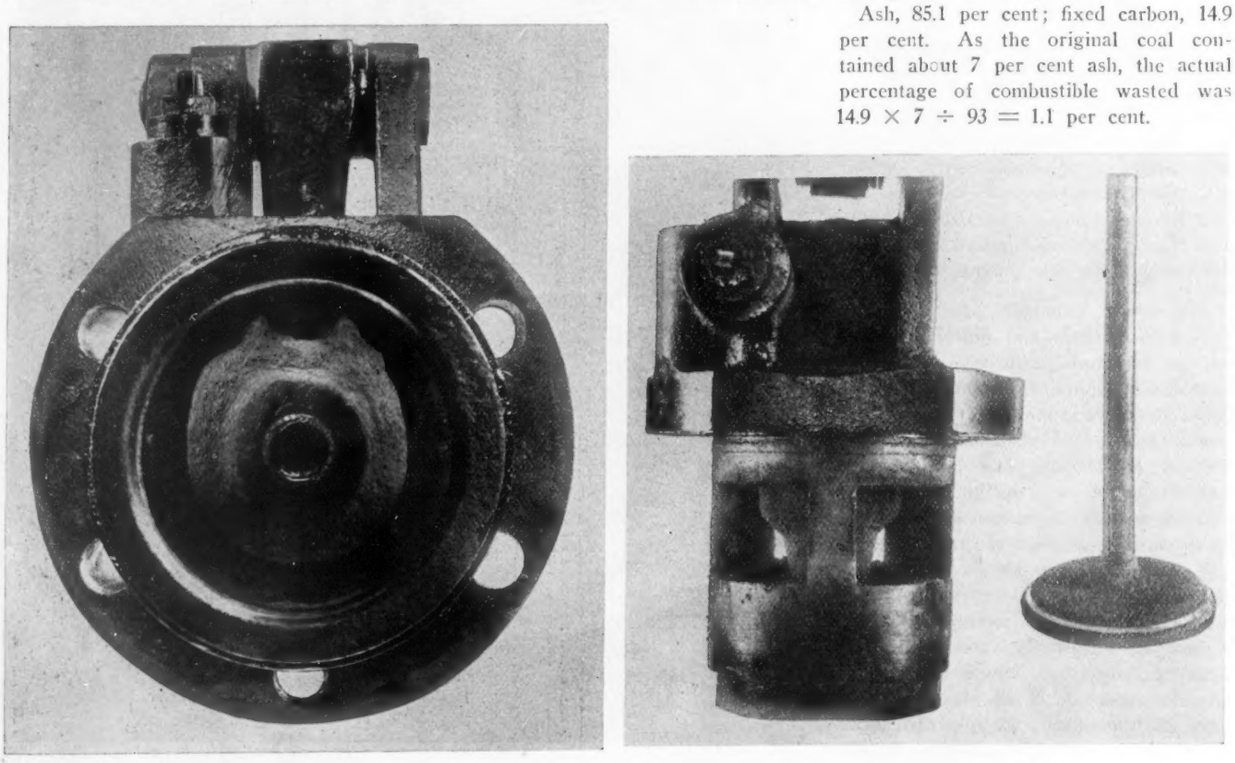


FIG. 3—INLET VALVE AFTER MORE THAN ONE YEAR'S OPERATION, SHOWING AMOUNT OF DEPOSIT.

Combustion Rate: The rate of firing varied from 13 to 22.8, averaging 18.5 pounds per square foot of fuel-bed area per hour at the green fuel zone. This higher rate might have been maintained indefinitely without vitiating the gas from excessive oxidization or without clinker formation. The temperature of the gas leaving the fuel bed averaged about 900 degrees Fahrenheit, low enough to prevent clinker. When the fire was allowed to become much hotter the heat value of the gas fell slightly. This temperature therefore serves as a fair index of practical limits in regard to fuel-bed temperature.

Heat Value: The average samples of gas taken from the engine show a heat value of about 115 B. T. U. effective power value; a considerably higher value could be obtained by using more vapor and producing higher hydrogen content. But high gas was not desired, as it would not permit the use of as high compression in the engines for which a gas of moderate heat value is better suited.

Brake Tests: During all the tests a 175-horsepower engine was kept under brake load, receiving all of the gas from the producer except when the latter was being forced beyond the capacity of the engine, and has provided a practical demonstration of the gas quality. As the engine gas was metered in both gas house and engine house, a check was thus available between the two meters and the extra load upon the producer determined.

Foreign Matter: Under normal working, the average gas samples at the discharge of the exhauster showed from 0.015 to 0.025 grain of solid matter per cubic foot of standard gas. During a week's test on the auxiliary washing plant, 25 determinations showed a range of solid matter from 0.006 to 0.043. This solid matter contains no tar, consisting entirely of dust and lampblack. The greater part of the heavier matter is generally thrown down at the discharge nozzle of the producer by a water spray.

Examination: This producer was opened on April 3, 1909, for the first time in one year. During this time the producer had been under fire continuously, under various operating conditions from maximum load to no load. There had been no repairs to the producer lining or other parts during this time of operation. The shut down was made in the presence of a number of officials of the United States Geological Survey, as well as some prominent commercial representatives. After examining the producer and noting the normal condition of the fuel bed, the quality of gas, as well as the load carried by the engine, the fire was pulled, affording a demonstration of the condition of the fuel bed inside of the producer after this long run. It was found that the producer lining was practically intact even in the regions of the hottest fire zones. The wall of the evaporator was also in good condition, as were the tuyeres at the bottom. Previous to the demonstration the plant had been in operation only 10 hours a day for about one month, and, although a straight air blast was employed in starting up, practically no clinker was found in the entire fuel bed. From one or two feet above the lower tuyere the fuel was practically all coke in the various stages of formation, from ash at the bottom to green coke at the top. No ash was found in any of the fuel bed proper, while the largest piece of clinker found was hardly over 6 inches in diameter. No clinker bridge formation was formed across the fuel bed, and at no time was it necessary to rake the fire or ash down. There was no difficulty in removing all of the fire bed, which settled down as the ash was removed, requiring only 45 minutes to do this work.

The interior of the static scrubber was examined. This had been in operation for practically four months, during which time Pittsburg coals, lignite and other materials had been tested. Only a slight deposit of sludge was found covering the perforated plates. During these four months the total drop in pressure through the scrubber had increased almost 4 inches, due to the deposit that had gathered. The material found consisted largely of lampblack, with very little evidence of tar formation. This is not extraordinary, for the reason that during part of the test, especially with refuse and high volatile fuels, the fires had to be started without the use of steam and with a shallow fuel bed, so that some deposits of tar might have been expected under the circumstances.

On the following day the water vaporizer was also examined internally. There were no cracks visible next to the hot fire, and no hard scale in the interior. In the bottom of the vaporizer there was a small deposit of sludge, but this was quite soft and was easily flushed out with a hose. The construction of the vaporizer with loose covers made it an easy matter to examine the interior at any time and remove any material scale or hard deposit that might tend to form.

Perhaps the most interesting exhibit was the condition of the inlet and mixing valves of the engine used on the test, and the piping and manifold. After a run of from July, 1908, to April, 1909, on intermittent operations, during which time the plant worked about the same number of hours, the condition of the valves and pipe lines was found to be about the same as when examined in July, 1908, after 1,000 hours' operation.

Conclusion: The most important points developed from tests and examination of this type of producer are the following:

(1) Continuous operation, producer under fire 12 months without cleaning.

(2) No short time tests, ten days to a full month.

(3) Performance tests under actual commercial conditions, without the formation of tar or clinker.

(4) Low-grade fuels successfully gasified.

(5) An average economy of slightly over one pound per brake-horsepower-hour for continuous operation, 1.25 pounds for 10-hour day, including stand-by loss, for average bituminous coal.

(6) Gas quite clean, uniform in constituents and free from tar.

(7) Commercial value of the gas actually tested by a gas engine of standard construction.

(8) Regulation of heat value and pressure automatic without gas holders, varying only 10 per cent from full to no load on plant.

(9) Efficiency of producer reasonably high.

(10) Labor required exceptionally small, one operator to three units.

Test on Bituminous Producer.

Coal	Pittsburg	Bituminous	Colo. Lignite
Date of test	May 8-23	August 4-25	April 16-29
Hours per day	24 hours	10 hours	24 hours
Total hours	297.75	514.0	314.0
Engine running hours	239.5	168.5	312.75
Hours shut down	58.25	345.5	1.25
Pounds coal fired	53,935.0	35,647.0	60,939.0
Total running coal		31,143.0	
Stand-by coal		4,504.0	
Pounds of coal per B. H. P. Total	1.12	1.24	1.61
Pounds of coal per B. H. P. Net		1.08	
Producer efficiency (per cent)	77.0		78.5
Combined efficiency, incl. stand-by (per cent)	17.0	15.74	16.6
Excluding stand-by (per cent)		17.91	
B. T. U. in coal	13,305.0	13,145.0	9,589.0
Ash in coal	6.77	10.76	7.37
Fixed carbon in ash		14.9	
Percentage of carbon lost		5.92	
Average load on producer	172.0	170.0	122.0

PRESSED STEEL RADIATORS.

The utilization of iron and steel materials in the manufacture of stamped products, has made marked progress in recent years. One of the latest important adaptations of rolled steel is that of the stamping of pressed metal radiators from sheets for steam and hot water heating.

The plant of the Pressed Radiator Co. of America, manufacturer of Kinnear pressed radiators of different models, and located at West Pittsburg, Pa., represents the most modern and advanced ideas in this line of production. The works cover approximately 2½ acres, the buildings are substantially constructed of steel and concrete, and the site is well served by railroad sidings connected with different trunk lines.

The equipment of the plant consists of the most up-to-date machinery, all presses being automatic and operated by electricity. The machinery is arranged in such a manner that the sheets are unloaded at one end of the works, are then conveyed to the different sized shears and cut into the section of radiator required. They are then sent through the different stamping operations and finally reach the end of the works crated and in condition for shipment. The entire manufacturing operation is continuous, and an observer may follow the process from the raw material in its preliminary stage, through the entire factory to the finished product. Pressed radiators are made from dephosphorized and decarbonized sheets Nos. 20 to 18 gage, which are especially rolled to consumers' specifications. Careful inspection of the sheets is made so that any undesirable properties may be eliminated, and claims are made as to the non-corrosive nature of the metal. As an extra precaution, in addition to a carefully selected and good grade of metal, the interior and exterior of the radiators are galvanized under the best known process, thus adding a double protection against impurities in water.

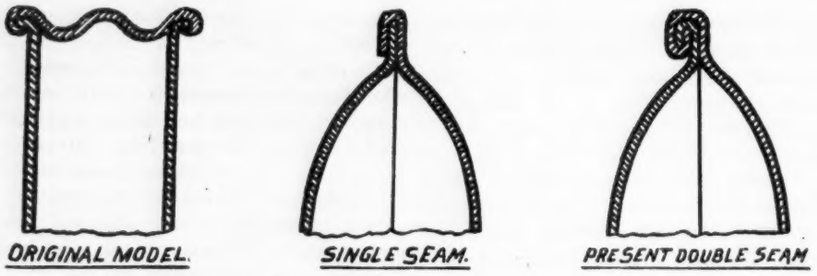


FIG. 1—EVOLUTION OF PRESSED RADIATORS ILLUSTRATED BY SECTIONS OF THREE MODELS.

The joints and connections of the different forms of radiators are constructed with the double interlocking seam as shown in Figs. 1 and 2, and are machine made. They are formed with dies and machinery especially designed for the purpose. When locked and seamed together, it is impossible to force them apart except under unusual and excessive pressure.

Each radiator after being assembled is tested by a hydrostatic pressure of 35 pounds to the square inch. In weight they are extremely light, weighing approximately two pounds to the square foot, and the fact that they may be readily handled is used by manufacturers as an argument in their favor.

On the question of durability, it is claimed that the uniform and selected material used together with the added protection of its being thoroughly galvanized inside and out, make the enduring qualities a matter of many years. At the present time it is stated that there are in use in New England many unprotected sheet radiators which were installed over 40 years ago, but the manufacture of which was abandoned because of the excessive cost.

FIG. 2—CROSS-SECTION OF TWO-COLUMN PRESSED RADIATOR.

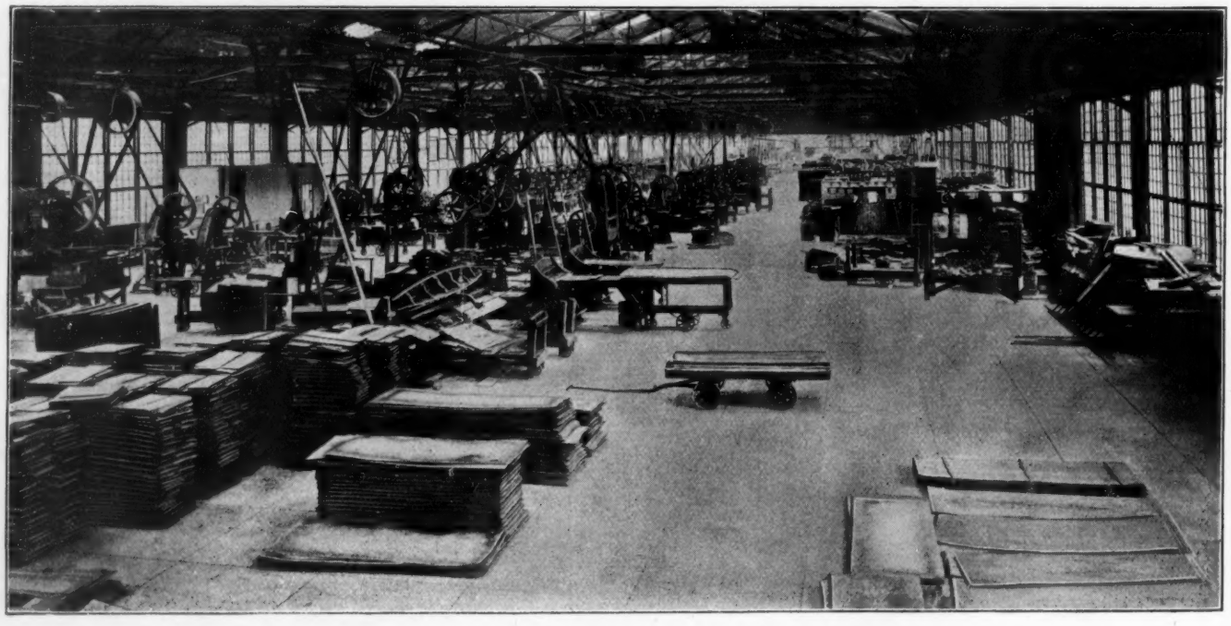


FIG. 3—INTERIOR OF SHOPS, PRESSED RADIATOR CO. OF AMERICA.

MAGNET GANTRY CRANE FOR STOCK YARD.

The magnet cantilever gantry crane illustrated was built by the Alliance Machine Co., Alliance, O., and covers the iron yard of the Worth Bros. Co. at Coatesville, Pa., which is located along the right of way of the P. & R. R. R. and which, when completed, will be nearly one-half mile long.

The crane is of 10 tons capacity and is equipped with an easily detachable lifting magnet so that it can be used for ordinary lifting purposes. It is constructed with two cantilever ends and arranged so that the trolley and its load can pass between the supporting legs. One end is provided with a 25-foot cantilever extension reaching over and commanding two lines of track alongside of the railroad right of way, and also a 15-foot cantilever extension on the opposite end to reach over one line of track. The span or distance between the rails on which the gantry travels is 60 feet, thus making a total width of space covered by the crane of 100 feet. The width between the gantry legs is so fixed that the largest size charging box can be carried through them at the highest point to which the trolley could lift the box and still leave ample clearance, thus avoiding any danger of the box striking the gantry even in the event of considerable sway. The height from top of rail to the under side of bridge is 25 feet, affording ample height for storing material and giving headroom for a man standing on top of the highest box cars. The bridge wheels have been especially designed so as to permit of a railroad switch crossing the rails on which the gantry travels.

The machinery for the crane is built under the standard specifications of the builders, which call for:

All gears to be of steel and have cut teeth, except drum gears which may be shrouded; all revolving shaft bearings to be bored and provided with split bronze bushings and tongued and grooved caps; through bolts used throughout, studs being entirely eliminated; track wheels keyed to axles which run in hexagon bearings of the M. C. B. type, and all shafts, bearings, and gearing to be entirely accessible so that any part can be removed without disturbing the other parts.

The speeds of the crane are as follows: Hoist, 50 feet per minute; bridge travel, 400 feet per minute; trolley travel, 150 feet per minute.

The bridge driving motor is mounted at the center of the bridge girders and power is conveyed to the track wheels by means of cross and vertical shafts as shown in the illustration.

The electric equipment is constructed for 220-volt direct current, and the current is carried to the crane by means of bare wires supported on arms projecting from ordinary telegraph poles.

The Reading Iron Co., which recently blew out its Keystone furnace at Reading, Pa., will rebuild it. The furnace ran 15 months.

THE FORMATION OF CARBON MONOXIDE IN GAS PRODUCERS.

Bulletin No. 30, on the rate of formation of carbon monoxide in gas producers, by Dr. J. K. Clement, L. H. Adams and Dr. C. N. Haskins, has just been issued by the engineering experiment station of the University of Illinois.

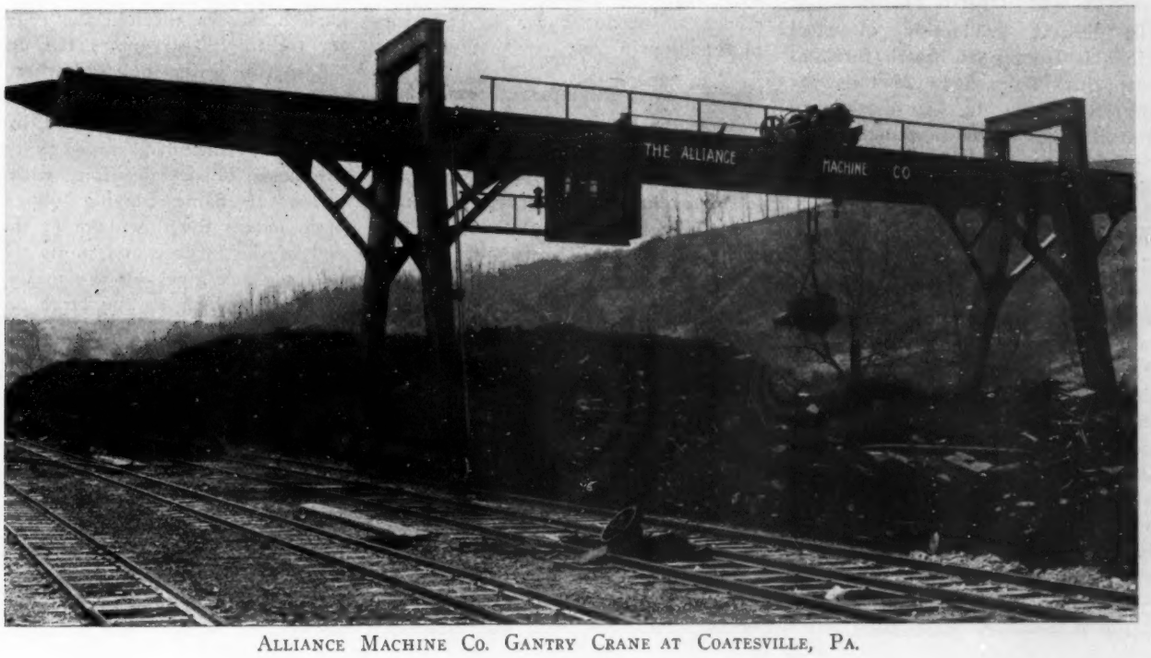
The problem attacked by the writers of this bulletin was the determination, so far as possible, of the factors that govern the production of carbon monoxide in gas producers. The chemical reaction expressed by the equation:

$$C + CO_2 = 2\ CO$$

which is fundamental in the action of the gas producer, was studied and a differential equation for the reaction-velocity derived. From this equation the velocity constants and the equilibrium constant were calculated from observed values of the percentage of CO formed in given time intervals. The rates of variation of these constants with the temperature were determined, and these were found to agree with van Hoff's laws. From the constants thus determined it becomes possible to calculate the percentage of CO formed for any time of contact of carbon and CO_2 and at any temperature.

It was found that the production of CO formed depends upon (1) the temperature, and (2) the time of contact of gas and carbon. With ordinary depth of fuel bed a high percentage of CO requires a high temperatures—1,300 degrees Cent. or above.

Copies may be obtained gratis upon application to the Director, Engineering Experiment Station, Urbana, Ill.



ALLIANCE MACHINE CO. GANTRY CRANE AT COATESVILLE, PA.

THE SMALL OPEN-HEARTH FURNACE*

Its Use in the Production of Steel Castings and Its Advantages Compared With Furnaces of the Larger Type

By W. M. Carr.

That the open-hearth process for the manufacture of steel is gradually gaining ground, can be proven by statistics. The reason for its supplanting other methods is mainly one of quality. Furthermore the basic open-hearth process permits a mixture of pig iron and miscellaneous steel scrap of a lower grade and cheaper price than the raw material necessary in other processes.

With the foregoing facts in mind, the author presents this article for the consideration of prospective investors in the manufacture of steel castings in small, moderate and large tonnages. To be more explicit, small tonnages include units of one-half, 1 and 2 tons per heat, moderate tonnages, 2 to 5 tons per heat, and large tonnages, 10 to 25 tons per heat.

In presenting these claims it is with the recognition of the following advantages:

First.—The small capacity furnaces cost less to install than any other steel-making devices excepting only crucible melting furnaces.

Second.—The economy of operation.

Third.—The certainty of results, the greater degree of control in operation and the reduction of the personal equation to the lowest possible degree.

Large Open-Hearth Furnaces.

The largest production of steel castings is from open-hearth furnaces of capacities from 5 to 25 tons per heat. Such practice is established and it requires a constant demand to be profitable as well as an investment of considerable capital varying with the size of the plant. It has been generally believed that capacities of less than five tons per heat were not possible by open-hearth methods, and engineers have dissuaded those who desired to engage in the manufacture of steel castings, either for their own consumption or the trade, from using open-hearth methods, since until quite recently the tendency has been rather to increase the capacity of the open-hearth supposedly for economical reasons rather than to build small units with less capacities.

The author, however, has had the opportunity of demonstrating the possibilities of the miniature open-hearth and has found from actual practice that it is economical, comparing operating costs with standard capacity furnaces. It can safely be said that the operating cost of the miniature open-hearth is less than that of any type of steel producing unit or process making steel in equal quantity.

To those who may not be familiar with an open-hearth furnace and its operation, a reference to the accompanying illustration may prove instructive. The upper part of the furnace is represented in sectional elevation. The structure is built of refractory bricks bound securely with structural steel beams and plates at certain points not shown. The lower part of the furnace, usually below the charging floor level or carried below the shop level, consists of the regenerator chambers, connecting flues leading to a reversing valve and thence to a stack. The hearth is practically a shallow dish lined with silica sand fused into one solid mass at a high temperature at the time of making bottom. This is the laboratory where the raw material is melted and refined to steel of any desired composition. In outline, the practice is as follows and refers to the operation of a miniature open-hearth fired with fuel oil, recommended in preference to producer gas in capacities of less than 5 tons per heat.

Operation of Miniature Open-Hearth.

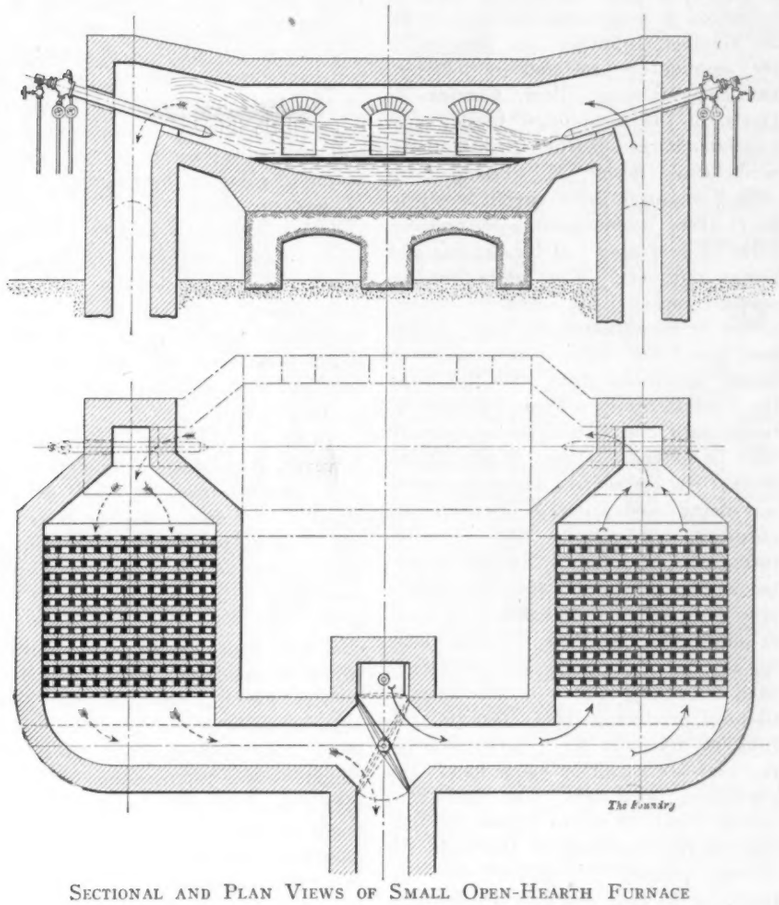
After the furnace has been brought up to a working temperature—white heat—a mixture of acid pig iron and low phosphorus steel scrap, in usually the following proportions—one-third pig and two-thirds scrap—is charged into the furnace, adding the pig iron first, and when that becomes molten it is followed by the scrap. The whole mass subsequently becomes liquid from the heat of the oil flame passing above it. At this stage the temperature of the furnace is reduced by the addition of the cold stock, but it will still be at a temperature above that required to melt pig iron. To raise the temperature above that required to melt steel and have it in condition to pour, the advantage of the principle of regeneration is available, which consists in returning to the furnace, waste heat which in other types of furnaces escapes to the stack. Without a system of regeneration it is not possible to reach a proper steel casting temperature, that is to say, a reverberatory furnace without regeneration gives a temperature, where the combustion of the fuel is supported by cold air, less than that required to properly liquify steel, but with the principle of regeneration applied to such a furnace high temperatures are readily reached.

Utilization of Waste Heat.

To understand this principle we will follow the course of the flame of the burning oil as indicated by the arrows in the illustration. Beginning at the right, oil is delivered to the burner shown surrounded with a water-cooled casing to protect the burner fittings. The oil is delivered either by gravity or pump pressure, but before reaching the end of the burner it is atomized or vaporized by compressed air. This air is designated as primary air and performs little or no part in supporting combustion of the oil vapor, and the quantity of air delivered above the amount necessary to promote combustion of the oil is known as secondary air. The secondary air enters the reversing valve, shown at the stack connection, passes through the regenerator on the right, enters the uptakes below the water-cooled burner casing, performs its function and passes along the roof of the furnace, in part, and the remainder, mixed with the products of combustion with the strata of flame playing above the bath, enters the downtake at the left end of the furnace and in its passage to the stack gives up the major portion of its heat to the large amount of brick-work piled within the chamber. When the waste gases have passed through the reversing valve and entered the stack they have just about enough heat to induce the necessary draft. Now, after an interval of 20 to 30 minutes, the burner on the right may be shut off, but not withdrawn from the furnace, the reversing valve is thrown and the oil and primary air turned on at the left end of the furnace. The secondary air will

*Presented at the Cincinnati convention of American Foundrymen's Association.

then be diverted by the reversing valve to flow through the left regenerator or checker chamber, and passing through innumerable passages in that set of checkers absorbs large volumes of heat radiating from the glowing bricks which became heated by the outgoing gases during a previous cycle of operation. This radiated heat, regenerating the secondary air, will be added to the temperature generated by the burning fuel and the products of combustion will accordingly have an increased quantity of heat units to deposit in the checker work at the outgoing or right end. In other words, whatever temperature may be carried in by the secondary air will be equivalent to an increase in efficiency of the burning fuel. Successive reversals of the fuel, primary and secondary air, produce constantly increasing increments in flame temperatures slightly below the melting point of the refractory brick-work. We have seen what can be accomplished by storing up and restoring to the furnace, waste heat from the products of combustion, producing the effect of a higher possible temperature than in any type of melting furnace. In addition, the reflection of heat from the walls and roof of the furnace upon the surface of the bath of metal, known as radio-activity, is more pronounced in a narrow melting chamber than in a wider one, and consequently there is a lower fuel consumption together with the possibility of superheating the steel in this miniature open-hearth. This has not been recognized heretofore, since most open-hearth furnaces are fired with producer gas, and since that fuel requires peculiar furnace construction to get the best results in burning it, it has not been found possible to make use of such fuel in a comparatively short furnace hearth and therefore, all furnaces designed to use this fuel must have a comparatively long hearth tending mainly in the direction of increased capacities rather than decreased output. On the other hand, the length of the hearth is not restricted where oil can be substituted for producer gas and therefore it has been found possible to operate an open-hearth furnace as small as 350 pounds capacity per heat. Thus a new field is opened for making steel by the open-hearth process.



SECTIONAL AND PLAN VIEWS OF SMALL OPEN-HEARTH FURNACE

Chemical Reactions.

Referring again to the operating method, we saw where the bath of metal was molten and at a moderate temperature. This temperature was due to the highly carburized condition of the metal since the presence of carbon lowers the melting point of iron. We saw how it was possible to gradually increase the temperature of the furnace by the regeneration of the secondary air, and with that constant elevation of temperature, dormant chemical actions will be set up. The first effect will be an oxidization of the silicon occurring mostly on the surface of the metal by the oxidizing action of the flame. The product would be silica which combines with whatever oxide of iron might be present in the bath of metal. The combination would form a slag of comparatively light weight that would rise to the surface and cover the bath. The slag is shown in the illustration by the heavy black line. This layer of slag prevents the metal below from coming into direct contact with the flame.

Carbon.

After the removal of the silicon, the next action is the removal of the carbon. This is a gaseous action and will cause bubbling or a boil throughout the bath. The action can be augmented from time to time by the addition of iron oxide in the form of iron ore. As the decarborization progresses, test plugs are taken from time to time, the operator judging the amount of carbon in the bath by their fracture and malleability. When the carbon has decreased to a predetermined point, the boil may be stopped or killed by deoxidizing agents such as ferro-silicon and ferro-manganese, in properly weighed amounts. The metal can then be transferred to molds. This method as outlined refers to the acid process. In it the elements, sulphur and phosphorus, are not removed. The basic process necessitates a hearth lining made of magnesite. Such a lining permits an addition of limestone to form a slag which will absorb the two elements and make a purer steel, chemically speaking, than the acid process, and at the same time allows the use of cheaper raw materials than the acid process.

With open-hearth furnaces designed to use producer gas and which rarely go below five tons capacity, it is not possible to adapt them to intermittent operation. Even in the smaller producer gas fired furnaces the roof span is considerable, resulting in

heavy stresses on the side walls and binding. These stresses will vary as the furnace may be heated and cooled, and if such alternations are frequent there is danger of collapse of the furnace. It becomes necessary, then, to maintain them at a steady temperature, continuously. Unless there should be demand for regular tonnage the fuel consumption during idle periods would be a constant expense.

In miniature open-hearth furnaces, owing to the comparatively narrow hearth chamber, the roof span is of course lessened, and therefore, whatever expansion or contraction there may be following heatings and coolings, will result in comparatively slight stresses, and these results decrease in effect with the lessened capacity furnaces, and they therefore lend themselves with greater ease and lessened liability of repairs to intermittent operation. The miniature open-hearth is most satisfactory in the rolling type with the body cylindrical, so that the stresses, even though slight, will be evenly distributed, whereas in a rectangular form the roof will always rest and thrust upon the inside walls. In fact the miniature open-hearth is not recommended to be built in the stationary type.

In conclusion, the miniature open-hearth is not costly to install, is comparatively simple to operate, gives results equal to standard open-hearth practice, makes hotter steel than the regular open-hearth and can show costs equally as low per pound of molten metal in the ladle.

PEAT AS A FACTOR IN THE FUEL QUESTION.

The statement is made by federal experts that millions of dollar's worth of fuel lies undeveloped in the swamps and bogs of the country, awaiting only the genius and business ability of the American before it drives the wheels of progress. Its value, on a basis of $3 a ton, roughly guessed at by experts of the Geological Survey, who have been studying the peat deposits for some time, is more than $38,000,000,000—more money than is represented in all the property, stock, implements and buildings owned by the farmers of the United States.

With the coal supply being used at a tremendous rate, peat is expected to become a most important auxiliary fuel and one that will prolong the life of the coal itself. An important fact which leads the experts to believe that peat will soon come into quite general use in certain parts of the country is that it is as a rule found in quantities in regions far removed from the coal fields, so far that the cost of transporting the coal amounts to several times the cost of the fuel itself at the mines.

The states containing the greatest amount of peat are the eastern Dakotas, Minnesota, Wisconsin, Michigan, northern Iowa, Illinois, Indiana, Ohio, New York, the New England States, New Jersey, portions of Virginia, North and South Carolina, Georgia and Florida.

A thorough investigation of the peat resources is now being undertaken by the Geological Survey, not only as to the amount of peat and its location, but also its use. Prof. Charles A. Davis, of the technologic branch, has general charge of the investigations, while Prof. Robert H. Fernald, consulting engineer in charge of gas producer tests, is endeavoring to find the value of peat as a fuel for heating and power purposes. The latter but recently returned from a trip to Europe where he investigated the uses of peat and found the older countries much farther advanced along this line than the United States. Prof. Fernald returns with the belief that peat will soon be extensively used in the United States. In Ireland, he found that peat was being used generally for domestic purposes, but not by the manufacturing establishments. "Sweden is dotted with peat deposits and its bogs are now being extensively utilized for power purposes," says Prof. Fernald. "During the last eight years new bogs have been constantly added to the list until bogs producing from 2,000 to 5,000 tons of dry peat for power purposes per year are found on every hand. The consulting engineers who have installed some of these plants are unquestionably working in the right direction, placing the power plant directly in the peat bog and transmitting the electric current to the surrounding towns. The current is being used for manufacturing purposes and also for lighting both the streets and houses. The installation of the power plant in the bog or at the mine has been advocated in this country by the technologic branch of the survey for installation of several thousand horsepower only, yet this principle is applied in Sweden to small plants and may be feasible in certain parts of this country.

"Another development in the line of peat industry which promises splendid returns is the use of peat in by-product recovery gas plants. From these plants both gas for power and sulphate of ammonia can be obtained in commercially paying quantities. Both the utilization of peat for producer gas and for the recovery of sulphate of ammonia are perfectly feasible with American peats. Although the work done on peat at the survey experiment plant has been limited, it has been demonstrated that gas for power can be made easily from both Florida and Massachusetts peat."

Prof. Davis, who has just issued jointly with Edson A. Bastin a bulletin on peat, is optimistic on the future of peat, yet he believes the development of the industry should be accompanied by great caution.

"The operation of a gas engine at the experiment plant on peat in one or two tests has shown that this fuel is but little inferior to many grades of soft coal now on the market and superior to some in the quantity of power gas produced," says Prof. Davis. "I believe the day is coming soon when cities located near the peat bogs and away from the coal fields will obtain their power and light from peat. I understand that Florida is to have a power plant soon that will use peat as fuel and will transmit the electricity to Jacksonville.

"In the development of this industry, however, it must be remembered that peat contains from 85 to 90 per cent water as it comes from the bogs. All but 15 or 20 per cent can be dried out by exposure of the peat to the air. In burning peat in gas producers to make power gas, this peat will burn successfully with 40 per cent moisture, which is impossible in a furnace.

"The burning of peat for power, heat, or light is but one of its many uses. The by-products of great value include coke, illuminating oils, lubricating oils, paraffine wax, phenol, asphalt, wood alcohol, acetic acid, ammonium sulphate and combustible gases of good fuel value. If used for fuel gas there is enough nitrogen stored in the peat resources of the country to supply 644,000,000 tons with a value of $36,000,000,000 in addition to the gas. Peat is capable of furnishing potential substitutes for wood in various departments of industry, and may relieve to a considerable extent the drain upon the vanishing forests. Paper is now being made from peat in Michigan. Possibly 5 per cent of the total peat in the United States, or 644,400,000 tons, is suitable for the manufacture of coarse paper and pasteboard, which will reduce the consumption of wood by whatever amount it displaces woodpulp in the manufacture of such articles."

Halt in Market Advance

Several more or less adverse features the early part of the week developed dullness with liquidation and irregular downward tendencies in the market.

Monday, Steel common advanced to the highest price ever quoted and the remainder of the list was firm and high in the early dealings, but afterward reacted and closed irregular; copper metal was weak in London but domestic prices were unchanged; the grain markets were lower on improving crop prospects. Tuesday, a general and decided reaction in the market developed, Steel common losing 2⅜ on the report of a hitch in the plan for listing the stock on the Paris bourse; the wheat market was weak and lower. Wednesday's opening was weak, but the close was firmer, most of the early losses being wiped out; the grain markets were lower and all grades of copper metal were reduced from ⅛ to ¼ cent. Decided weakness was shown Thursday, and although later in the day there was a partial recovery, yet the close was unsettled; copper metal was lower in London as well as in New York. Less activity was noted Friday, but prices, with the exception of steel stocks, recovered slightly. Saturday was the dullest day for weeks on the exchange, not quite 200,000 shares being sold in two hours; prices were irregular, but the average slightly higher.

Call money during the week was uniformly easy, ranging between 2 and 1½ per cent with an average of 1¾ per cent. Time money was rather easy. The gain in cash reserves reported by New York banks Saturday was $4,848,400, and the increase in surplus was $1,453,600. The actual condition of clearing house banks was reported as follows: Loans decreased $35,277,500; deposits decreased $33,924,800; surplus increased $13,197,200; and the percentage of reserve was 27.05, an increase of 0.06. Non-member banks and trust companies reported loans increased $9,706,900; net deposits increased $14,634,300, and the percentage of reserve 19.1, an increase of 0.3. Bank clearings for the week were 5½ per cent below the preceding week, or 50.6 per cent above the corresponding week last year. Net earnings of railroads for the month of April increased 22½ per cent over the corresponding month last year. Idle freight cars for the fortnight ending June 9 showed an increase of 4,624, this being the first increase reported in three months. Commercial failures for the week were 230, compared with 254 the preceding week and 260 the corresponding week last year. Shares were sold to the number of 4,751,811, compared with 5,238,741 the preceding week, and 1,696,422 the corresponding week last year. Bonds, exclusive of government bonds, were sold to the amount of $26,283,000, compared with $34,615,000 the corresponding week, and $15,407,000 the corresponding week last year.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quo. June 21	Changes in Week	Date Ann.	1909 M't'g.	Stock Outstanding	Dividend Basis	Dividend Last Declared	Dividend Date Last Div. Pay.
Allis-Chalmers	15⅜	— ⅝	Sept.	2	$19,820,000			
Allis-Chalmers, pr	51⅞	— ⅞			16,150,000	7 cum	1¾ Q.	Feb., 1904
American Can	11⅞	— ⅞	Feb.	2	41,233,300			
American Can, pr	81¾	—2¾			41,233,300	7 cum	1¾ Q.	July, 1909
Am. Car & Foundry	55¼	—1¼	June	24	30,000,000		½ Q.	July, 1909
Am. Car.& Fdy., pr	117	.....			30,000,000	7 n. c.	1¾ Q.	July, 1909
American Loc	58¾	—2¾	Oct.	19	25,000,000	5	1¼ Q.	Aug., 1908
American Loc., pr	117¾	— ⅛			25,000,000	7 cum	1¾ Q.	April, 1909
American Ship	60⅛	+ ⅛	Oct.	13	7,600,000	4	1 Q.	June, 1908
American Ship, pr	109	+ ½			7,900,000	7 n. c.	1¾ Q.	Oct., 1908
Am. Steel Foundries(new)	49	+2	Dec.	2	17,184,000		.....	.....
Am. Steel Foundries, pr	47½	.....			17,240,000	6 cum	1	Aug., 1904
Barney & Smith	30	.....	June	1	2,000,000	4	1 Q.	Sept., 1907
Barney & Smith, pr	91	.....			2,500,000	8 cum	2 Q.	June, 1908
Bethlehem Steel	29	—1¼	April	6	14,862,000		.....	.....
Bethlehem Steel, pr	60	—2			14,908,000	7 n. c.	¾ Q.	Feb., 1907
Cambria Steel	40¾	—1½	March	16	45,000,000*	3	1½ S. A.	Feb., 1909
Cambria Iron	46¼	+ ¼			8,468,000*	4	2 S. A.	Sept., 1908
Chicago Pneumatic Tool	25½	.....	Feb.	15	6,145,800	4	1 Q.	Oct., 1907
Colorado Fuel	42½	—1⅜	Oct.	18	34,235,500		3½	April, 1902
Crucible Steel	9¼	— ½	Oct.	20	24,578,400		.....	.....
Crucible Steel, pr	70¾	— ⅞			24,436,500	7 cum	1 Q.	Mar., 1909
Empire Steel	5	—3½	April	27	1,254,770		.....	.....
Empire Steel, pr	58	.....			2,500,000	6 cum	3 S. A.	July, 1909
Fay & Egan	90	.....	Feb.	18	1,000,000	7	1¾ Q.	Nov., 1908
Fay & Egan,pr	125	.....			1,000,000	7 cum	1½ Q.	May, 1909
General Electric	161	—2¾	May	11	65,178,800	8	2 Q.	July, 1909
Harbison-Walker	19¾	+1¼	Jan.	18	18,000,000		½	Oct., 1907
Harbison-Walker, pr	85	+1½			9,600,000	6 cum	1½ Q.	April, 1909
International Pump	39¾	—1⅜	June	8	17,762,500		1	April, 1905
International Pump, pr	87⅛	—1			11,350,000	6 cum	1½ Q.	May, 1909
Lackawanna Steel	47	+5	March	10	34,971,400		.....	.....
Lake Sup. Corp	24½	—2¼	Oct.	6	40,000,000		.....	.....
New York Air Brake	88	—1⅛	June	17	8,012,500	8	2 Q.	Oct., 1907
Niles-Bement-Pond	100	.....	Feb.	3	8,500,000	3	1½ Q.	June, 1909
Niles-Bement-Pond, pr	100	.....			2,000,000	6 cum	1½ Q.	May, 1909
Otis Elevator Co	57	.....	March	15	6,375,300		1½ S. A.	April, 1909
Otis Elevator Co., pr	98½	+ ½			6,295,000	3 n. c.	1½ Q.	July, 1909
Penn Steel	50	.....	May	10	10,750,000		.....	.....
Penn. Steel, pr	110	.....			16,500,000	7 n. c.	3½ S. A.	May, 1909
Pittsburg Coal Co	13	.....	March	9	28,104,600		.....	Nov., 1906
Pittsburg Coal Co., pr	50	.....			27,071,800	7 c.	1¾	April, 1905
Pressed Steel Car	42	—2⅛	Feb.	17	12,500,000		3	Aug., 1904
Pressed Steel Car, pr	103¾	— ¼			12,500,000	7 n. c.	1¾ Q.	May, 1909
Pullman	190	+ ⅝	Nov.	10	100,000,000	8	2 Q.	May, 1909
Railway Stl. Spring	43⅛	—1⅜	March	4	13,500,000	2	1 S. A.	Oct., 1908
Railway Stl. Spring, pr	105	—3			13,500,000	7 cum	1¾ Q.	July, 1909
Rep. Iron & Steel	30¼	—2	Oct.	20	27,191,000		.....	.....
Rep. Iron & Steel, pr	107	+ ¼			20,416,900	7 cum	1¾ Q.	July, 1909
Sloss-Sheffield	82	—1	March	10	10,000,000	5	1¼ Q.	June, 1909
Sloss-Sheffield, pr	117	.....			6,700,000	7 n. c.	1¾ Q.	July, 1909
U. S. Pipe & Fdy	33¼	—1⅜	June	23	12,500,000	2	½ Q.	Dec., 1907
U. S. Pipe & Fdy, pr	84¼	— ¼			12,500,000	7 n. c.	1¾ Q.	Sept., 1908
U. S. Steel	66¾	—1½	April	19	508,302,500	2 n. c.	½ Q.	June, 1909
U. S. Steel, pr	123¾	—1¼			360,281,100	7 cum	1¾ Q.	June, 1909
U. S. Steel, 5s	105¼	— ½			463,798,000	5	5 A.	.....
Va. Iron, Coal & Coke	62½	—2½	Sept.	21	9,073,680		.....	.....
Westinghouse Elec	83⅝	—3¼	June	16	27,173,200	10	2½ Q.	April, 1909
Westinghouse Air Brake	115	—1	Oct.	5	14,000,000*		2½ Q.	Oct., 1907

Par value of shares, $100, except those starred (*), $50.

Copper Stocks.

New York.—Amalgamated Copper closed 81⅝, a net loss of 3¾.

Boston.—Butte Coalition closed 25½, a net loss of 1; Calumet & Hecla closed 655, a net loss of 20; Calumet & Arizona closed 104, a net loss of 4½; North Butte Mining closed 57, a net loss of 3; Quincy Mining closed 91, a net loss of 2.

Financial Notes.

The Youngstown Sheet & Tube Co. declared a stock dividend of $3,000,000, together with the regular quarterly dividend of 2 per cent in cash, payable July 1; the Westinghouse Air Brake Co. declared the usual quarterly dividend of 2½ per cent, payable July 10; the Crucible Steel Co., the quarterly dividend of 1½ per cent, on preferred, payable June 30. Three months ago a dividend of 1 per cent was declared.

The National Enameling & Stamping Co. has sold to New York bankers an issue of $3,500,000 refunding first mortgage real estate sinking fund 20-year 5 per cent gold bonds, due June 1, 1929.

NEWS FROM MANY INDUSTRIES

New Buyers:—

The Dietz & Roemer Brass Co., Baltimore, with $5,000 capital stock, has been incorporated by Conrad Dietz, Edward D. Roemer and D. Meredith Reese.

The Proctor Metal Mfg. Co., Milwaukee, has been incorporated by J. Lester Proctor, Louis F. Flipse and William Magie, with a capital stock of $25,000.

The Twin Heat Stove Co., Lebanon, Ind., with $50,000 capital stock, has been incorporated through M. W. Swain, N. D. Byram and E. E. Gates.

The Standard Electric Specialty Co., Cleveland, has been incorporated by W. J. Bowen, Arthur A. Coombs, Robert W. Coombs, A. F. Askerman and E. Witowsky. The capital stock is $10,000.

A certificate of incorporation was granted to George A. McCauley, Jacob Noll and Henry H. Hubner to do business as the Mallory Machine Co., Inc., Baltimore, with $5,000 capital stock.

The Meadville Metallic Vault Co., Meadville, Pa., with $30,000 capital stock, has been incorporated by Carl Bender, Fred G. Prenatt, Dr. W. H. Rouche, G. E. Shaffer and T. J. Lyon, Meadville, Pa.

The Bolivar Foundry & Machine Works, Bolivar, Pa., with $20,000 capital stock, has been granted a charter. Those interested are John S. Miller, John Rugh and L. H. Miller, Bolivar, Pa.

The Peck-Williamson Foundry Co., Cincinnati, with an authorized capital of $50,000 has been chartered by W. C. Williamson, W. H. Murphy, A. J. DeCamp, E. O. DeCamp and W. H. Gregg, all of Cincinnati.

Articles of incorporation have been filed by the Steel Concrete Construction Co., Harrisville, Pa., with $25,000 capital. The incorporators are Eugene E. Wick and John H. McCoy, Harrisville, and Don Rose, Sewickley, Pa.

A certificate of incorporation has been granted to the Kinnel Edge Tool Forging Co., Columbus, O., capitalized at $30,000. The incorporators include P. H. Kinnel, H. L. Harbison, L. H. Frankenberger, G. E. Bazler and P. F. Wilkinson.

Lewis J. Miller Co., Bergen, Genessee county, N. Y., manufacturing machines for capping tin cans, with $60,000 capital stock, has been chartered by Lewis J. Miller, Bergen, N. Y.; Oliver McCormick, Easton, Pa., and Lucius G. Atwater, Batavia, N. Y.

The Southwestern Iron & Steel Co., Gainesville, Tex., has been granted a charter, with an authorized capital of $50,000. The incorporators are R. H. Dorsey, Mora C. Clark and John M. Maupin.

A charter has been granted to the Ahlm-Zorn Engineering Co., Cleveland, which is capitalized at $10,000. C. E. F. Ahlm, K. M. Zorn, S. J. Kornhauser, R. T. Ahlm and Else M. Zorn are the incorporators.

A charter has been granted to the Garwood Bronze & Iron Works, Garwood, N. J., to conduct a general foundry business. The authorized capital is $50,000, and the incorporators are W. S. Tuttle, John C. Loud and Edmund E. Field Jr.

The Arkansas Foundry Co., capitalized at $25,000 capital stock, has been incorporated to engage in the foundry business in Little Rock, Ark. The incorporators are Thomas H. T. Rogers, Fred I. Brown, Eugene Vogler, Irwin K. Miller and T. C. Morris.

Articles of incorporation have been granted to the Consolidated Machine Co., Chicago, to manufacture tools and appliances, with an authorized capital of $1,000. West, Eckert and Taylor, First National Bank building, Chicago, Ill., are the incorporators.

The Bergen Bridle Iron Co., Brooklyn, manufacturing bridle irons, anchors, etc., has been incorporated with $10,000 capital stock. The incorporators are: John W. Abrams, Tribune building, New York City; James T. McElhinery, 201 St. Johns Place; H. P. Anderson, 5209 Third avenue, both of Brooklyn, N. Y.

The Central Machinery & Supplies Co., New York City, has filed application for a charter to manufacture and deal in machinery, hardware, etc., and conduct a machine shop. The company is capitalized at $5,000, and has these incorporators: E. J. Forhan, J. J. Harper and H. M. Browne, 154 Nassau street, New York City.

The Cherokee & Cat's Fork Iron & Coal Co., Grafton, W. Va., has been incorporated with a capital stock of $500,000, by William L. Browning, George M. Whitescarver, of Grafton; John A. Luttrell, of Parkersburg, W. Va.; William A. Carr, of Hyattsville, Md., and Frederick Schoenherr, 24 Hopkins place, Baltimore, Md. This company owns 21,000 acres of land in Elliott county, Ky., and proposes to develop the property.

The American Laminated Belting Co., New York City, manufacturer of beltings, lacings, fasteners, leather goods, with $50,000 capital stock, has been incorporated by Frank F. Hopping, Edmund A. Usina, 111 Hudson street; G. Herbert Smith, 103 Park avenue, all of New York City.

A charter has been granted to the Union Tool Co., New York City, manufacturer of hardware and hardware supplies, with an authorized capital of $1,500. The incorporators are Sidney Vollman, 239 East Eighty-seventh street; Nathan Scheuer, 1718 Second avenue; Julius Hoffman, 1169 Vyse avenue, all of New York City.

The American Steel Rim Co., Chicago, has applied for a charter to manufacture steel rims and wheels, with $5,000 capital stock. George P. Merrick, 100 Washington street, Chicago, is mentioned as an incorporator.

The Franklin Foundry Co., Columbus, O., with $10,000 capital stock, has been incorporated by Gilbert N. Hamilton, John N. Charles, John J. Rees, Mrs. Gilbert N. Hamilton and Mrs. Ada M. Rees.

The Atlas Hanger Co., Chicago, manufacturing in metals, with $50,000 capital stock, has been incorporated by Ellis D. Whipp, 420 Ashland block, Chicago.

McCain Bros. Mfg. Co., Chicago, manufacturing machines and machinery, has been incorporated with $5,000 capital stock by H. B. Spurlock, 720 Reaper block, Chicago, Ill.

The Senn Mfg. Co., Inc., 115 Market street, Camden, N. J., manufacturing "Senn's" patent steel pressed garden tools, has been chartered with $50,000 capital stock. The incorporators are Edward Senn Sr., George Senn and Otto Boysen, 214 Philadelphia avenue, Egg Harbor, N. J.

New Construction:—

The new foundry of the Crane Co., which is now being built near Fourteenth street, Chicago, will cost $500,000 for the building alone, beside the equipment.

Baldwin, Tuthill & Bolton, Grand Rapids, Mich., manufacturers of woodworking and saw-sharpening machinery, have had plans prepared for an addition to their plant. Construction will be commenced early in the fall.

The Avery Mfg. Co., Peoria, Ill., manufacturing agricultural implements, has taken out a building permit for an office building to cost $35,000, which will be 45 x 175 feet, two stories and basement, of concrete and steel construction.

The Colorado Ingot-Iron Pipe & Culvert Co. is installing its machinery at Manitou, Colo., in a building recently purchased. The company ex-

pects to begin making pipe within a few days in sizes ranging from 8 inches in diameter to 7 feet.

The Sailor-Whitmore Machine Co., Menasha, Wis., has completed plans for a foundry at its plant on River street. Permission of the government is being sought to construct a retaining wall along the Fox river at the rear of the property, and when this has been done the construction of the building will be started.

The new foundry at Northampton, Mass., which has been established by Edward Murphy on West street, has been placed in operation, with Alvin Hartley as manager. The molding floor will provide for 12 molders, and the cupola has a capacity of three tons. Gray iron castings will be produced, but no machine work will be done at the plant for the present at least.

The D. J. Murray Mfg. Co., Wausau, Wis., is erecting a foundry of concrete and steel, 80 x 140 feet. The cupola will be moved from the old building into the new one, and an additional cupola larger than the old will also be installed, as well as a new core oven, thus doubling the plant's present capacity. The company has completed plans for a new machine shop adjoining the present shop 56 x 300 feet, two stories.

The A. O. Smith Co., Milwaukee, manufacturer of pressed steel automobile frames and parts, is planning the erection of new shops at Keefe avenue, just outside the city limits of Milwaukee. It is estimated that the new plant will cost approximately $500,000. The main building will be one story, 275 x 800 feet; the power plant 40 x 60 feet; and the office building 50 x 125 feet. All the buildings will be of reinforced concrete construction.

The Racine Steel Casting Co., of Racine, Wis., has purchased a tract of land, consisting of one and three-quarter acres, where it is planned to erect a foundry and machine shop, perhaps by fall. The company is occupying several buildings owned by the Belle City Malleable Iron Co., of Racine, under lease, but has outgrown its quarters and is now on so sound a basis that it is profitable to build its own plant.

The Jacob J. Vollrath Mfg. Co., of Sheboygan, Wis., manufacturer of enameled ware, has purchased a site of 29 acres near the Sheboygan city limits and on the belt line of the C. & N. W. railroad, and will build a large plant there. The company has a large factory at Sixth and Michigan avenues, Sheboygan, covering nearly an entire block, but lacks adequate railroad facilities. The present location has become the heart of the residence district and it is believed that the sales of the lots will more than repay for the removal to a location that is choicer from all standpoints.

The Vulcan Iron Works Co., 1726 Wazee street, Denver, Colo., advises relative to some prospective new construction that it expects soon to construct a building 60 x 375 feet, brick and steel, located at the corner of West Colfax avenue and Osage street, on ground adjacent to the Denver & Rio Grande railroad tracks. Seventy-five feet of the West Colfax avenue end of the building will be used for an office and warehouse; the rear 65 feet to be used for a forge shop, and the remainder of the building, 235 feet, by the machine shop. The equipment will include the tools now operating in the old shops on Blake and Wazee street.

The Fort Wayne Electric Works, Inc., Fort Wayne, Ind., advises respecting future plans that it is not the intention of the company to erect an iron foundry. About a year ago, it built a modern fire proof two-story building, and the company intends to move into it shortly. In this building it is proposed to mold on a gallery and use the first floor for cleaning rooms, annealing furnaces, for handling sheet iron and for japanning ovens and such other devices that can be easily moved elsewhere in case it is found necessary to use the floor for heavy non-ferrous castings, which has always been the company's intentions. In the meantime, the company intends to make the best use possible of the entire building, not as a foundry, but part for foundry use and part annealing and part sheet iron manufacture. Fuel oil will be used exclusively in all its furnaces, and the saws, tumbling barrels, air compressors, etc., will be individually driven by direct connected motors. In fact the company plans to make its foundry if possible one of the most up-to-date from a practical and useful standpoint.

General Industrial:—

The Artisan Brass Co., Chicago, has filed notice of increase of capital stock from $10,000 to $50,000.

The Burroughs Adding Machine Co., Detroit, has increased its capital stock from $5,350,000 to $5,550,000.

The Hartford Auto Parts Co., Hartford, has increased its capital stock from $50,000 to $100,000.

The Oliver Machinery Co., Grand Rapids, Mich., has filed notice of the increase in its capital from $150,000 to $650,000.

Involuntary bankruptcy proceedings have been begun at Cincinnati against the Dayton-Hydraulic Machinery Co., Dayton, O., by several creditors.

The Chicago Steel Tape Co., 6233 Cottage Grove avenue, Chicago, advises that it is not the intention of the company to enlarge its plant, as was noted some days ago.

O. M. King has sold his interest in the foundry and machine shops of F. B. Eccleston & Co., Nebraska City, Neb., to his partner F. B. Eccleston, and has leased the King drill plant.

The Stover Foundry & Mfg. Co., Meyerstown, Pa., has sold twelve No. 12 type pipe-threading and cutting-off machines, motor-driven, capacity 4-inch to 12-inch, to Spang, Chalfant & Co., Pittsburg.

The Steel Car Forge Co., Pittsburg, with works at Ellwood City, Pa., has purchased the site of the Peerless Glass Co., six acres in all, lying immediately north of the forge plant, for $13,000.

The recently noted increase of $50,000 in the capital stock of the Chicago Hardware Mfg. Co., North Chicago, Ill., was made for the purpose of building a new plating room, adding dynamos, molding machinery, etc.

The Bessemer Limestone Co., Youngstown, O., recently re-elected directors and these officers at the annual meeting: President, Joseph G. Butler, Jr.; secretary, C. C. Blair; treasurer and general manager, C. M. Crook.

The Phillips & Buttorf Mfg. Co., Nashville, Tenn., advises that while it has purchased a piece of ground, yet the publication in the daily press of an item to the effect that it would erect a foundry on the site is premature and unauthorized.

The Scott Stove & Furnace Co., Cambridge City, elected these officers at its recent annual meeting: President, F. W. Marson; vice president, Claude Kitterman; secretary, C. H. Graver; treasurer and manager, B. F. Wissler; who with R. L. Smith compose the board of directors.

The Monarch Tool Co., 120 Opera Place, Cincinnati, punch, lathe and experimental work, advises relative to its recent incorporation that it has been operating for about five years, making a specialty of dies, special tools, etc., as well as general manufacturing.

Henry O'Leary and John Beckman have purchased the Portage Lake Boiler Works, Ripley, Mich., and will hereafter conduct the business under

the firm name of Beckman & O'Leary. The works, which have been closed for some time, will be re-opened shortly with excellent prospects for operating at capacity.

The Longmont Foundry & Machine Co., Longmont, Colo., which was recently incorporated, has chosen these officers: President, E. L. Carl; vice president, J. A. Van Deventer; secretary, A. Dakan; treasurer, Mrs. E. L. Carl, who together with V. O. Nichols of Johnstown, constitute the board of directors.

The Ardmore Foundry & Machine Co., Ardmore, Okla., has been placed in the hands of W. H. Wimberly as receiver, and President James D. Flynn has resigned as officer. The receivership followed the filing of a suit instituted by the Ardmore Bank against the company for the collecting of three notes of $2,500.

A contract has been signed by representatives of the Stanley Works, Inc., New Britain, Conn., builders' hardware, with the board of trade of Niles, O., in which the Stanley company agrees to build a branch plant at Niles, to cost at least $100,000. A site, including 17 acres of land, has been provided by the Niles board.

The stockholders of the Cresson Foundry, Machine & Car Co., Cresson, Pa., recently elected these officers: President and general manager, H. S. Shoff; secretary, P. N. Shettig, of Ebensburg; treasurer, Frank Hartman, of Ebensburg; assistant secretary and assistant treasurer, John F. Parrish. The old board of directors was re-elected.

The DeBriggs Mfg. Co., Portland, Conn., manufacturing wire goods, which recently went into the hands of a receiver, has been sold to the Portland Specialty Co., recently incorporated by James H. Barry and David Barry, both of Portland. It is understood that the Portland company will continue the manufacture of wire goods.

S. T. Antcliff, who founded the Brass Foundry & Heating Co., Peoria, Ill., has disposed of his holdings of stock to Jacob J. Kasjens, who has been associated with him in business for 20 years, and E. B. Hazen, who has been a member of the company for 14 years. They will continue the business at its present location, on South Adams street. Mr. Kasjens has been chosen president and Mr. Hazen will continue secretary and treasurer. Mr. Antcliff gave as his reason his desire to retire from active business.

The Union Machine & Supply Co., Nashville, Tenn., has changed its name by charter amendment to the Atlas Machine Co. Thomas Parkes, who was formerly in charge of the mill supply and contracting department of Keith, Simmons & Co., has resigned and has been elected vice president and general manager of the Atlas Co. The Atlas company will continue to operate the Union company's shops at 134 Third avenue north, and has also leased a large building on Commerce street and will shortly remove into the new quarters.

The receiver of the Gardner Convertible Steam & Gas Engine Co. will offer for public sale on June 26 all rights and titles, together with the patent rights and franchises of the Gardner company, on the site of the plant at Washington, Pa. The full machine equipment together with a line of patterns, stock of supplies, etc., will also be sold.

The American Metal Co., Ltd., New York City, has increased its capital stock from $3,000,000 to $3,500,000, and the number of its directors from six to seven. At the same time, it amended its articles of incorporation so as to permit stockholders to distribute part of the net earnings each year among its officers and employes for services rendered.

The Quincy, Manchester, Sargent Co., Plainfield, N. J., in order to simplify details in connection with correspondence, telephone, etc., has deemed it advisable to change its name and will hereafter operate under the name of Q. M. S. Co. This change has been under consideration for some time, owing to the general objection to the old name from its inconvenience in pronunciation.

The Bethlehem Foundry & Machine Co., South Bethlehem, Pa., advises in reference to the proposed new construction that it is erecting a new foundry building which will considerably increase its foundry output, feeling that conditions warrant this extension. It has already purchased its cupola and blower, and most of the other material required in connection with rebuilding.

The Albany Malleable Iron Co., 51 State street, Albany, N. Y., announces that it has taken over the business of the Torrance Malleable Iron Co. With its new plant, the increased facilities and modern equipment at its Voorheesville, N. Y., plant, the Albany company is in a position to handle all orders for malleable iron and semi-steel castings in a prompt and satisfactory manner.

The American Safe & Lock Co., 206-12 Lawrence street, Cincinnati, which was recently incorporated, advises that it is the purpose of the company to manufacture a full line of fireproof safes and vaults. At a meeting of he stockholders, June 4, these officers were chosen: President, John C. Warth; vice president and manager, Fred W. Baum; secretary and treasurer, Russell R. Andrews, who, together with F. W. Goedells and Frank Moore, constitute the board of directors. The company is now occupying manufacturing quarters and has placed orders for practically all the machinery equipment that it will require.

The plant of the Ohio Brass & Iron Mfg. Co., Buttles and Factory avenue, Columbus, O., has resumed operating after a shutdown of almost 18 months. J. B. Orbison, president and manager of the plant, is quoted as saying that the outlook for business is bright. The plant has been overhauled and placed in excellent condition, and has orders for brass and aluminum castings now on hand which will insure steady operating for a number of months.

Fires:—

The foundry of George Sinclair & Sons, Ltd., Wiarton, Ont., was badly damaged June 14, the loss being placed at $6,000, with $1,500 insurance.

The building of the Peninsular Milled Screw Co., as well as the plant of the Michigan Stamping Co., Detroit, were seriously damaged June 16. The loss of the Peninsular company is estimated at $80,000, with one-third insurance; that of the stamping company, $30,000, with one-half insurance.

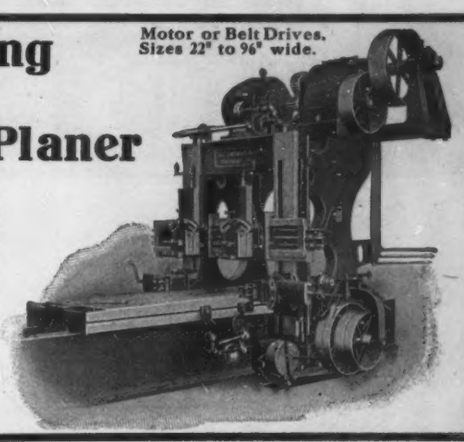
Trade Notes:—

The Pratt Engineering & Machine Co., of Atlanta, Ga., which was organized last January to acquire the properties and business of the Fulton Foundry & Machine Works, and which has been preparing to continue the work of its predecessor in sugar machinery, fertilizer works and sulphuric acid works machinery field, has opened offices for Cuba and Porto Rico in Lonja del Comercio, No. 509, Havana, Cuba. This office will be in charge of W. A. Parsons, as manager for Cuba and Porto Rico. Mr. Parsons has been special agent for the West Indies Oil Co., with headquarters in Havana for some time. This appointment has been announced in addition to those of Messrs. Geare and Helmer, of the Pratt company, mentioned in this column last week.

The Petroleum Iron Works Co., Sharon, Pa., announces that its Pittsburg offices have been removed to room 1220 Farmers' Bank building, with R. T. McCormick continued as manager of the Pittsburg offices.

Reduce Your Cost of Planing 25 to 50 Per Cent.

The Cincinnati Variable Speed Planer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The variable speed feature has proved itself the secret of economy in modern planing because it instantly provides the correct speed for all materials and conditions. Four changes are to be had, from 15 to 60 feet a minute, and roughing or finishing cast iron, steel or brass are handled at the exactly proper speed to get highest economy.

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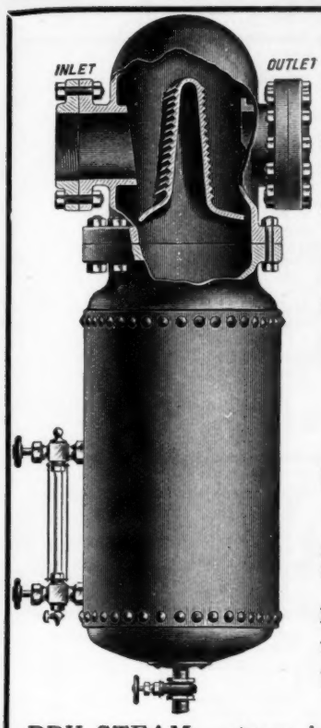

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Fig. 300

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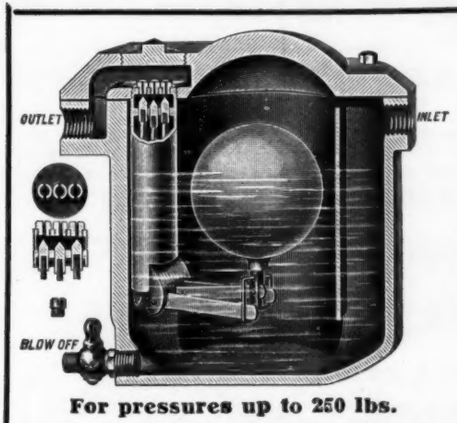

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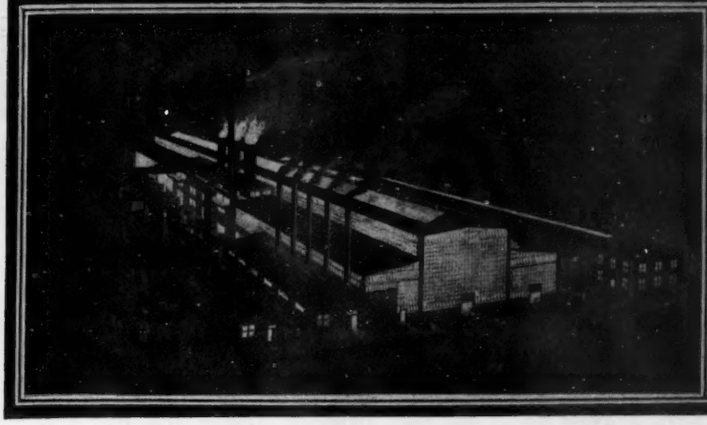

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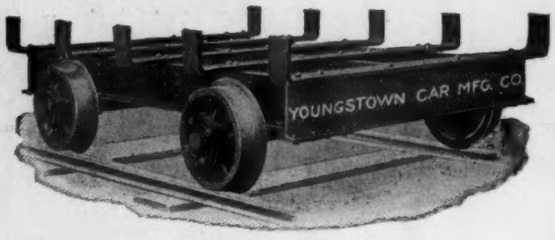

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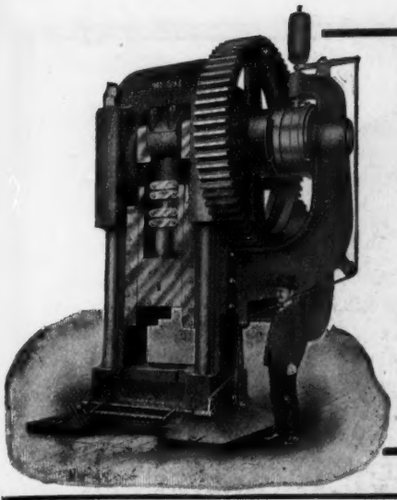

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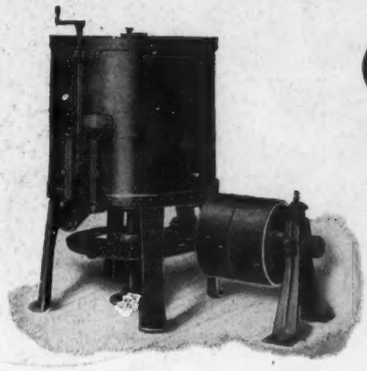

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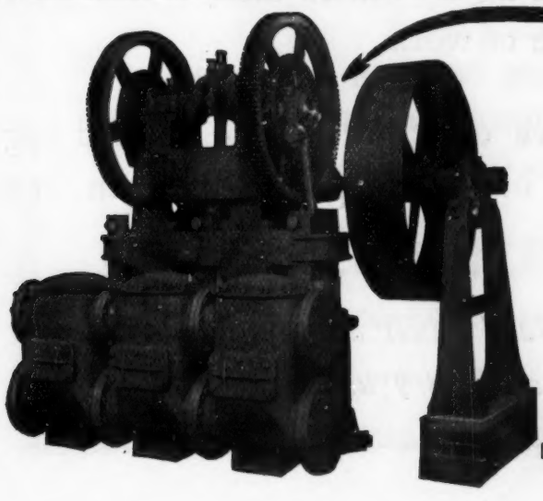

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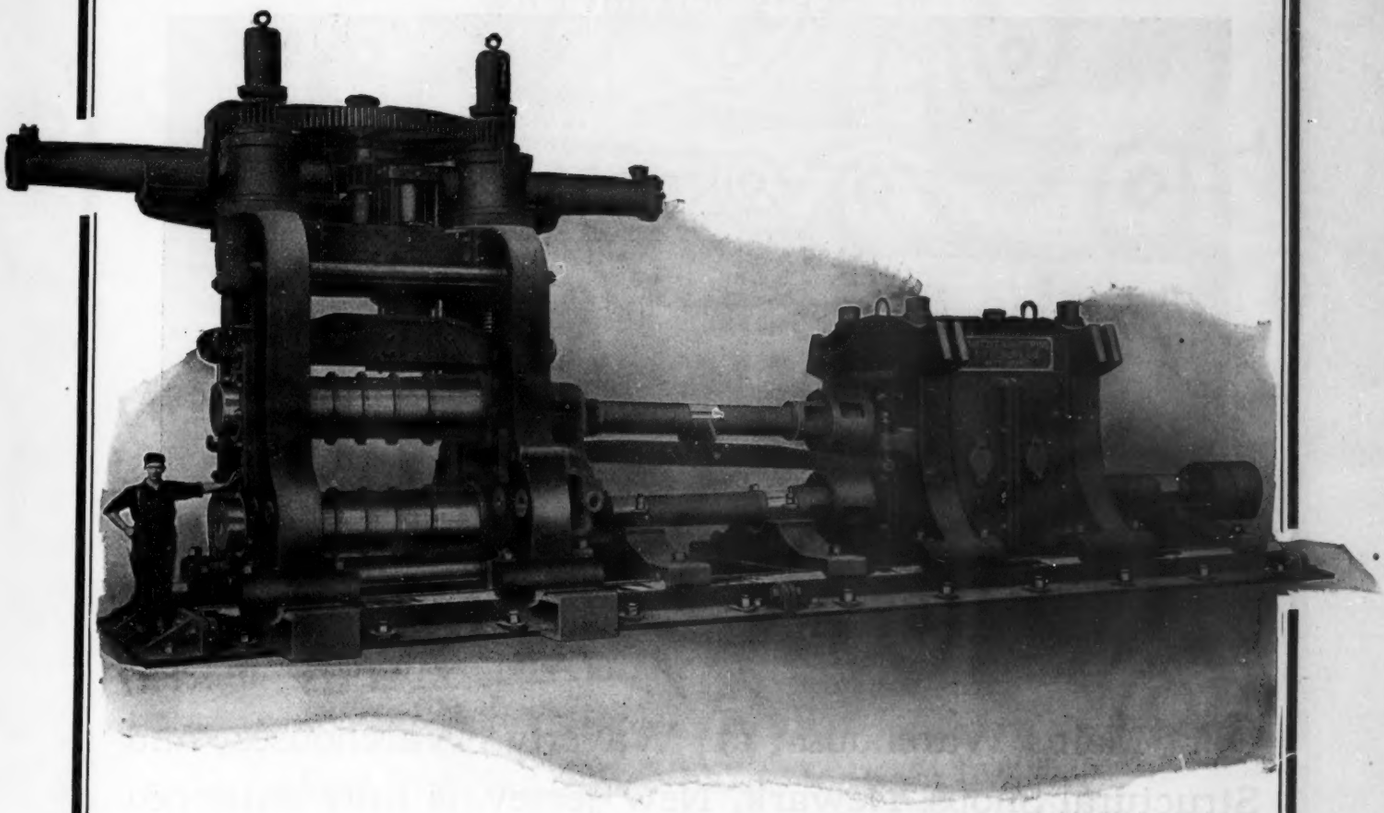

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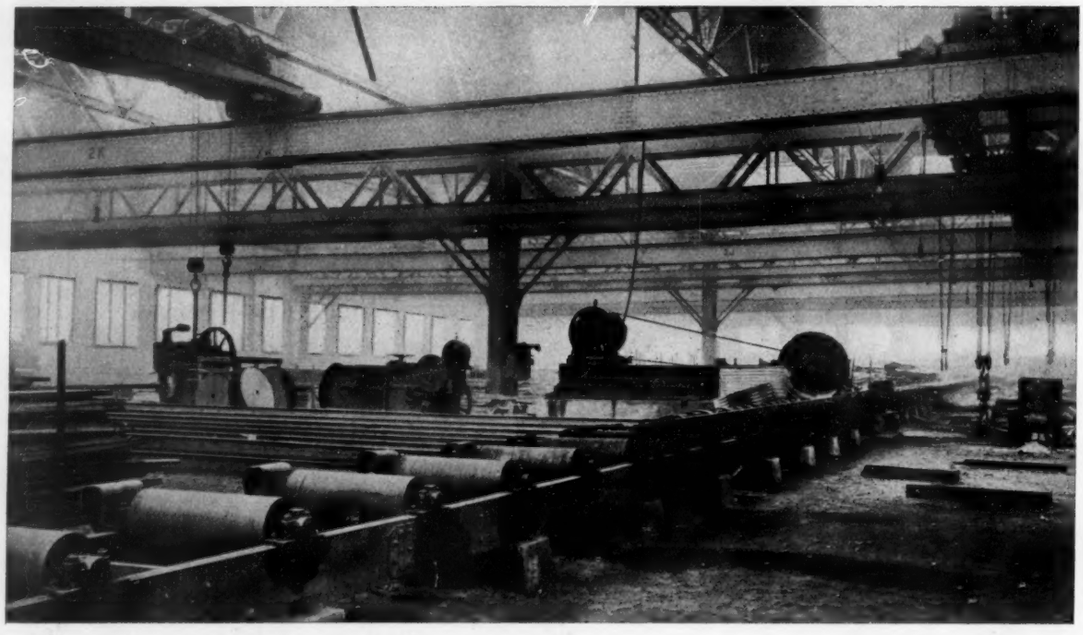

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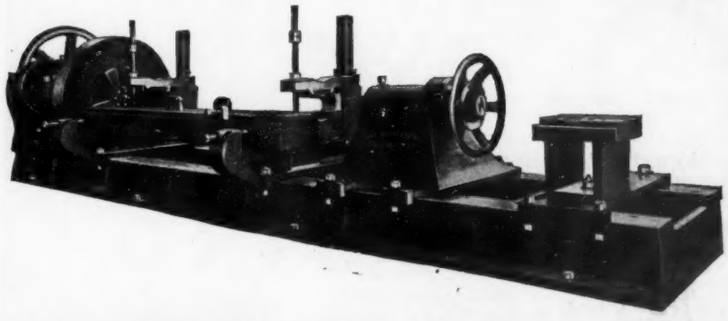

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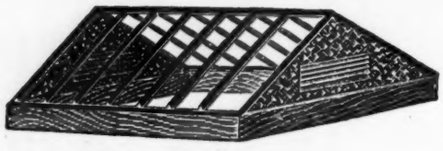

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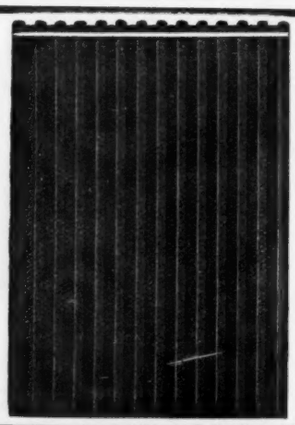

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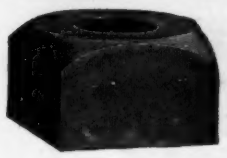

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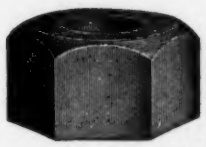

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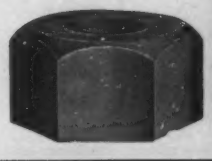

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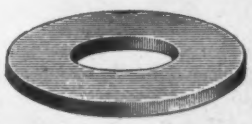
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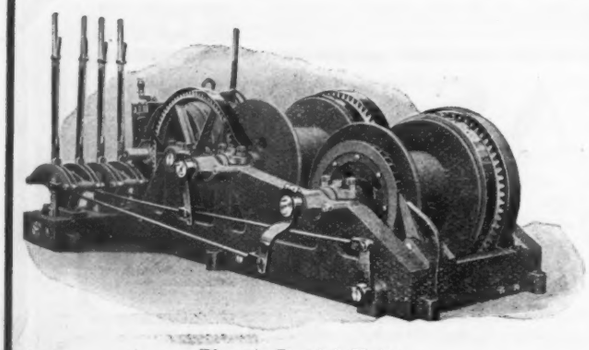

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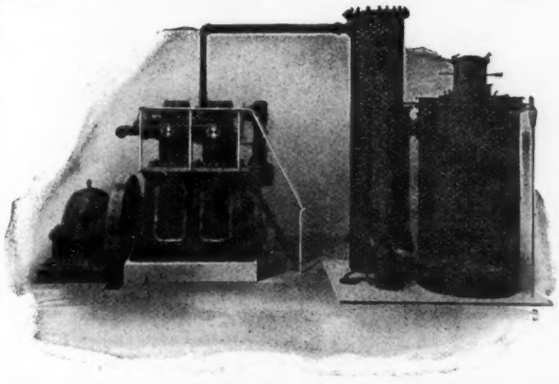

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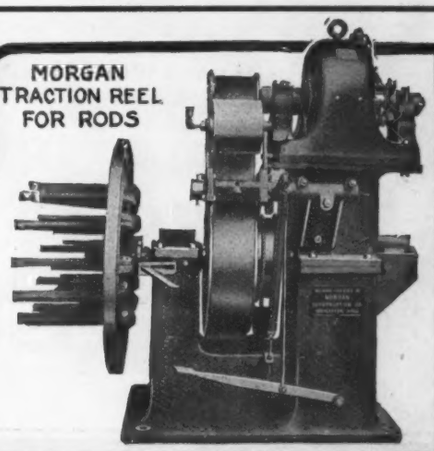

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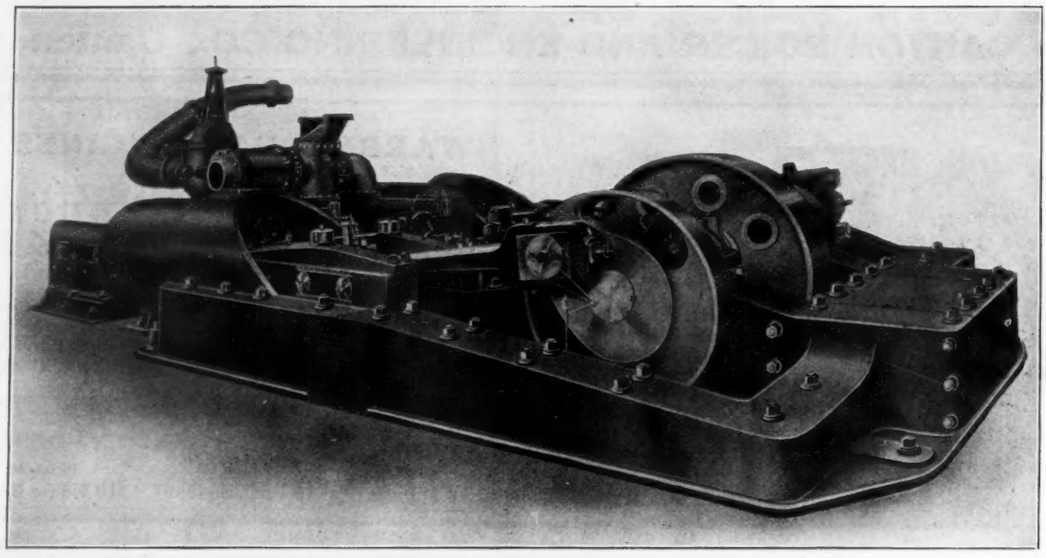

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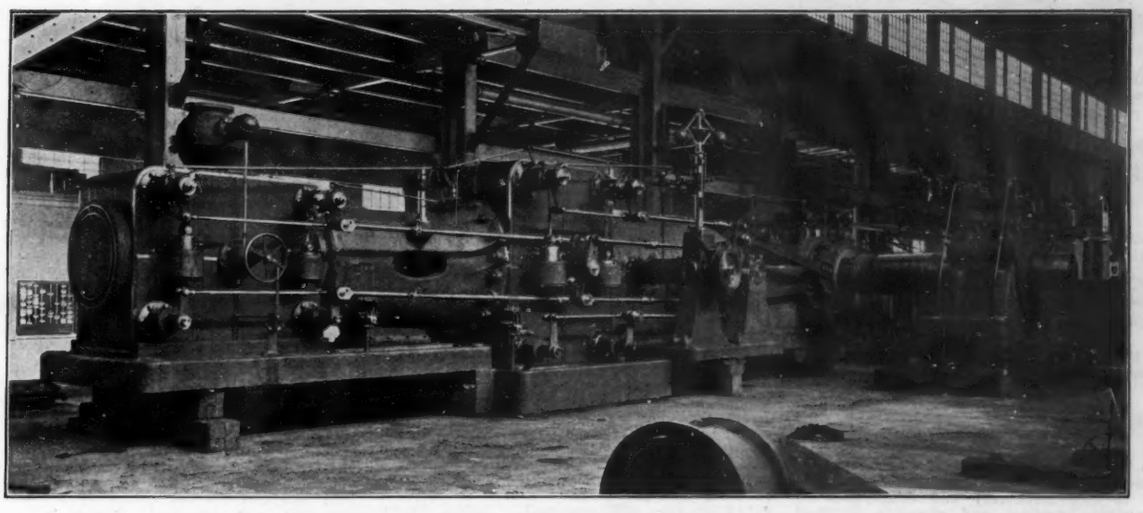

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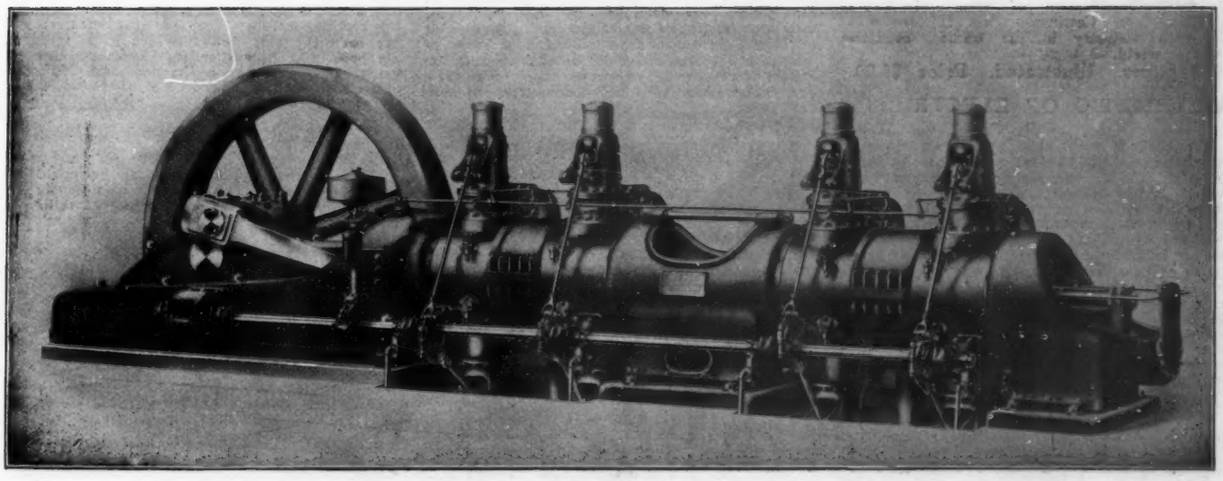

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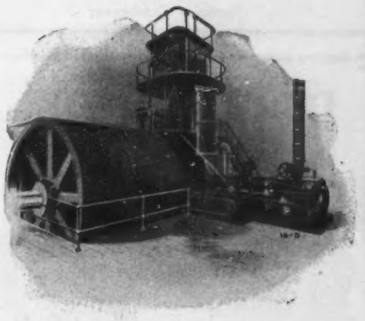

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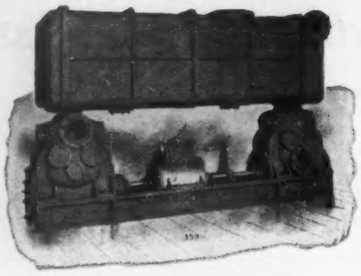

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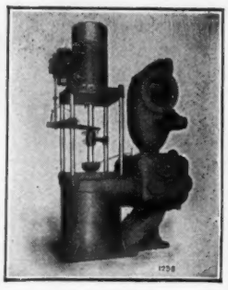

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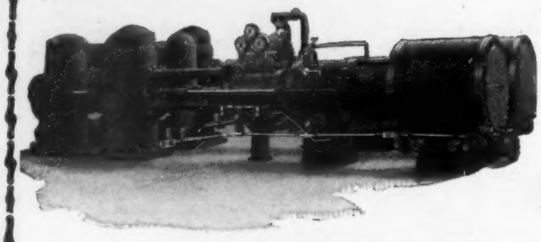

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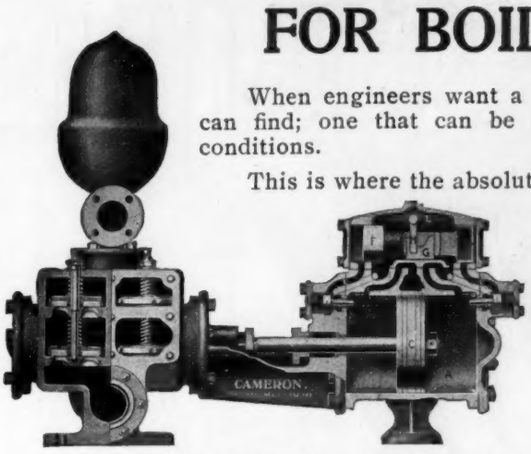

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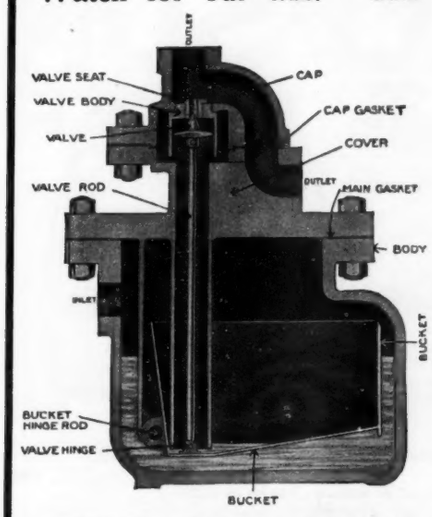

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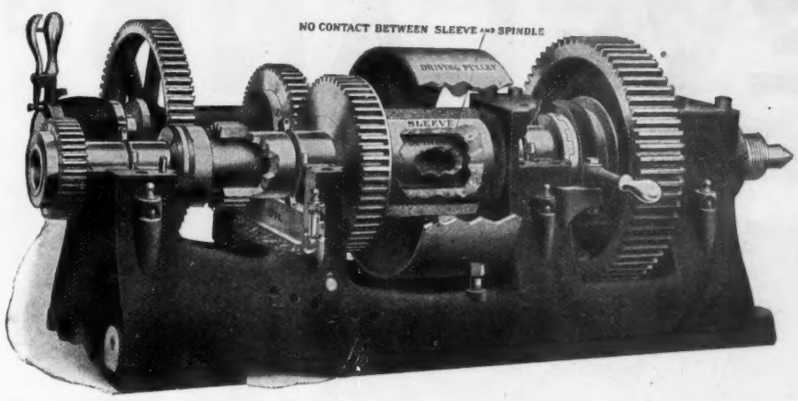

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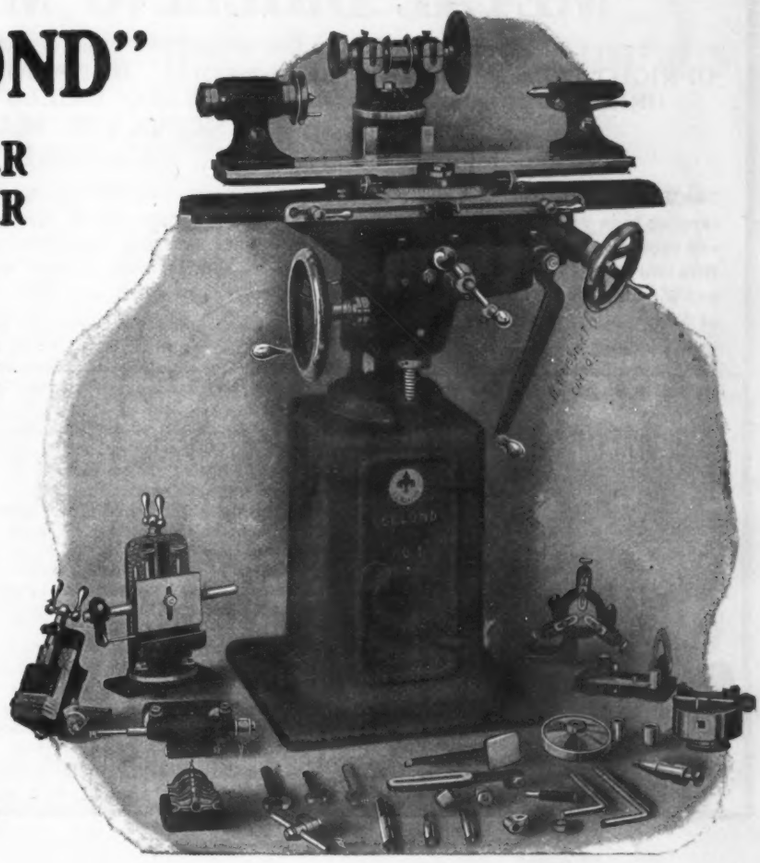

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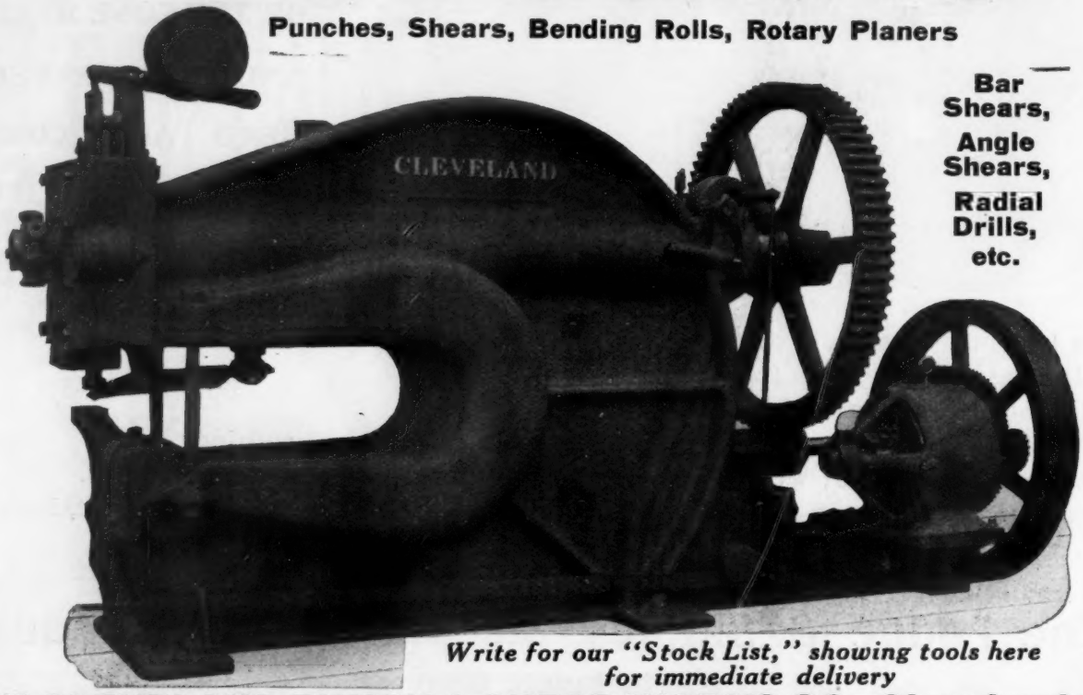

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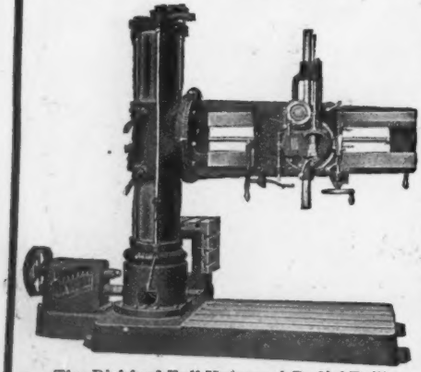

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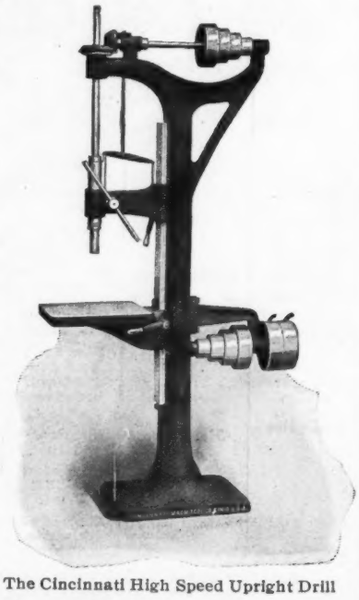
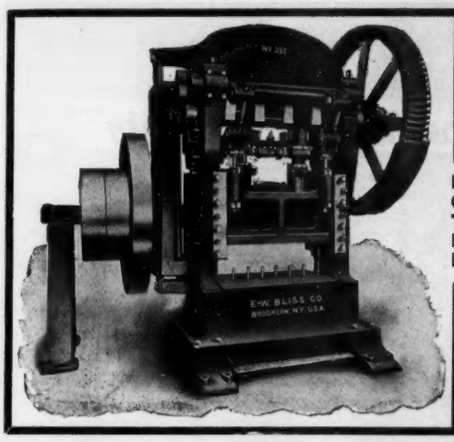


The Cincinnati High Speed Upright Drill



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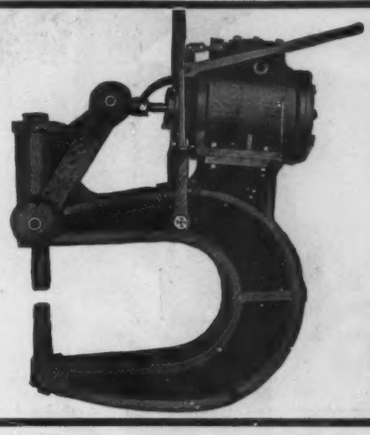

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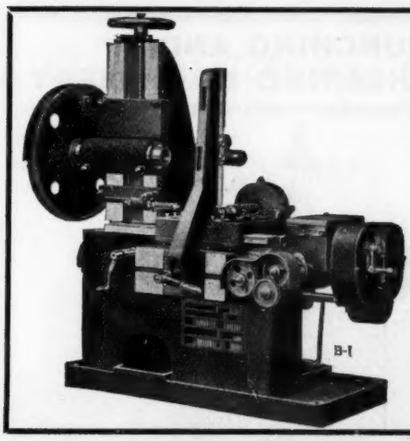

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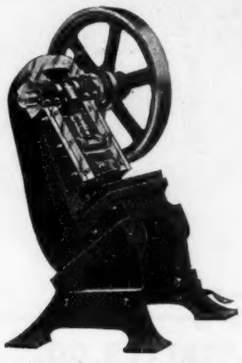

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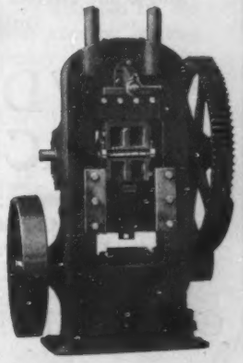

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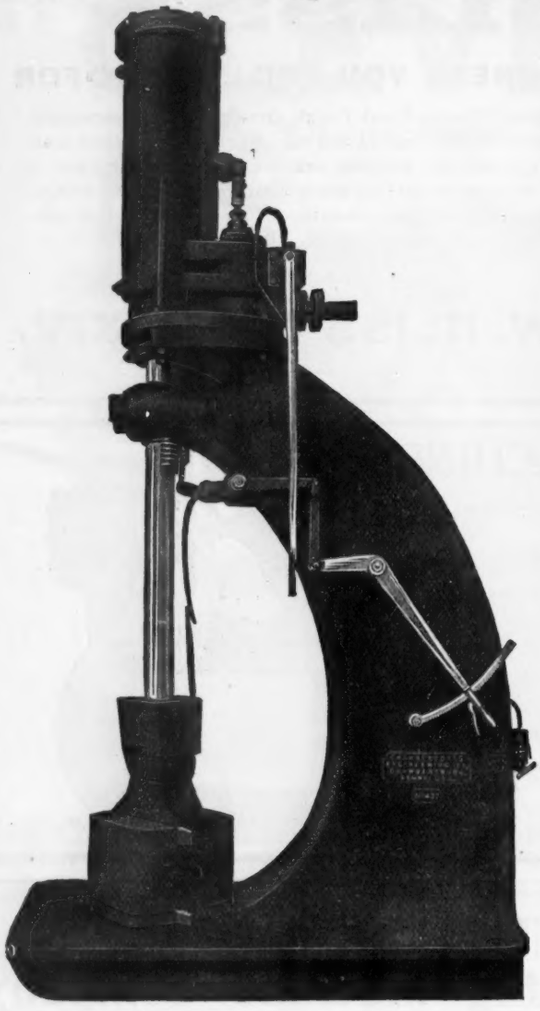

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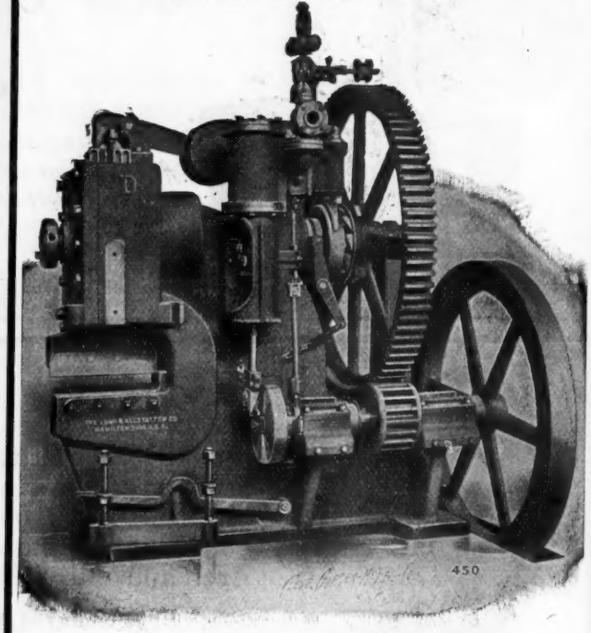

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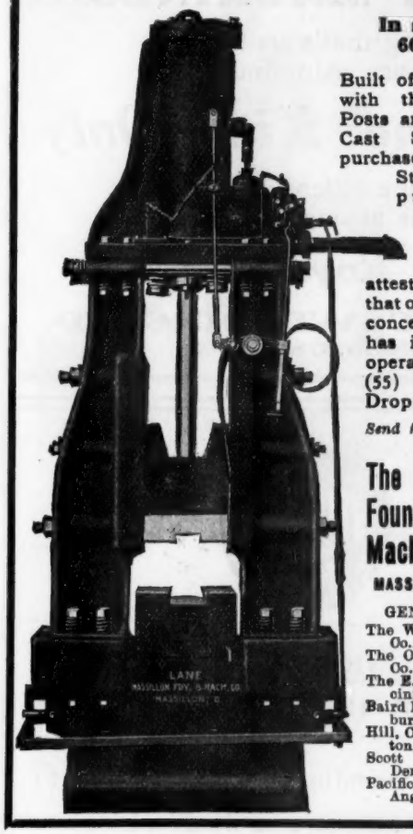

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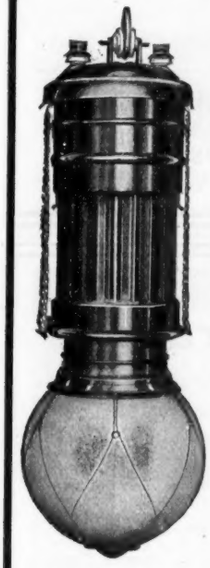

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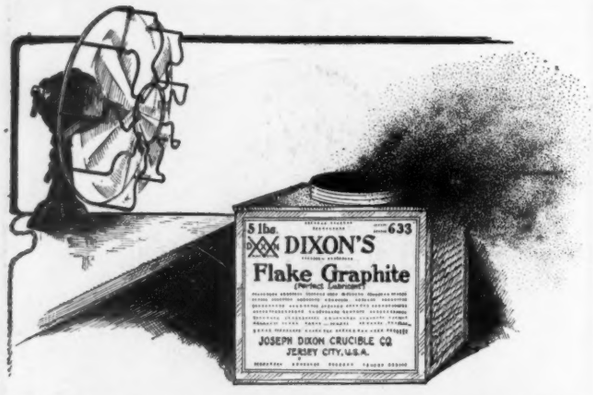

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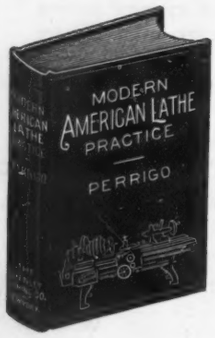

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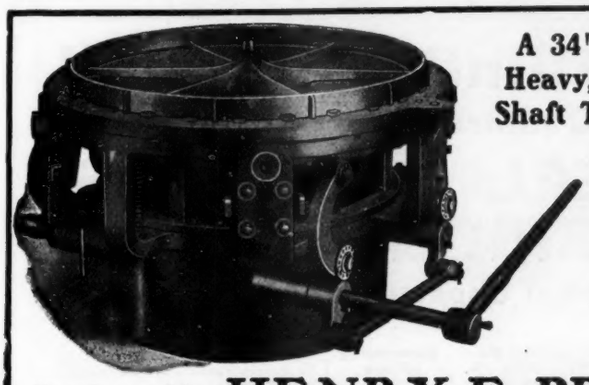

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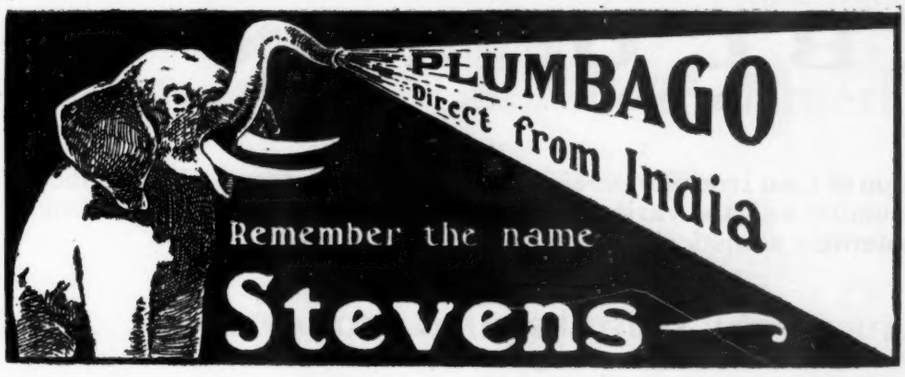

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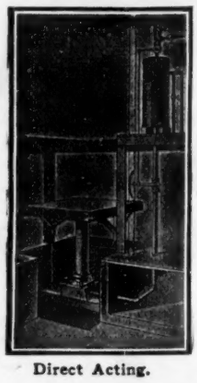

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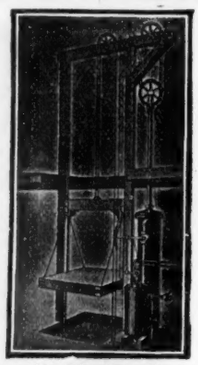

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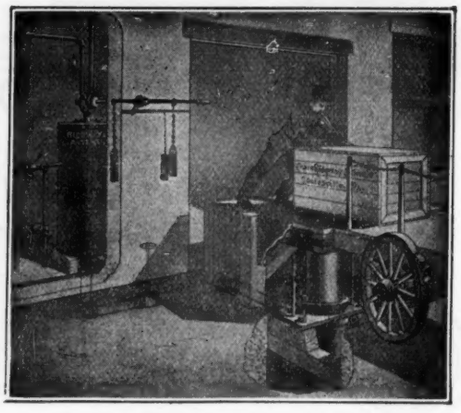

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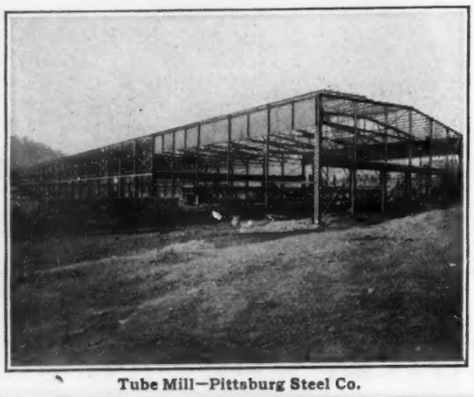

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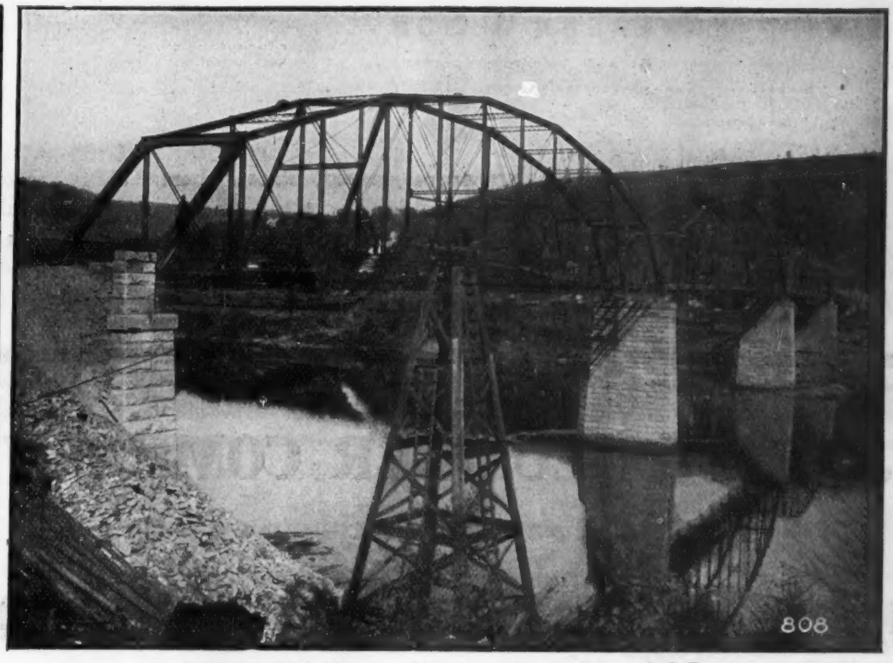

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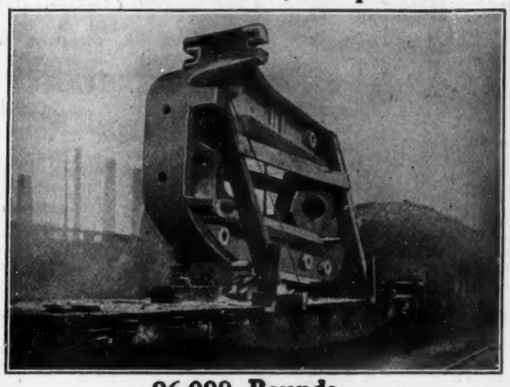

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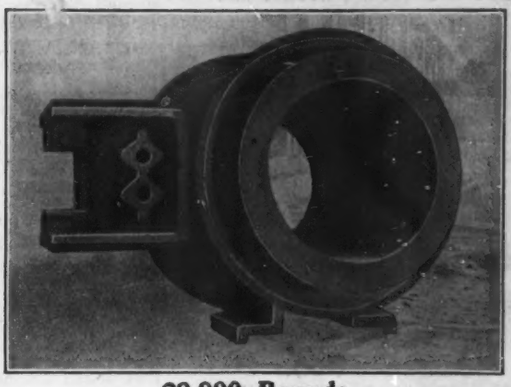

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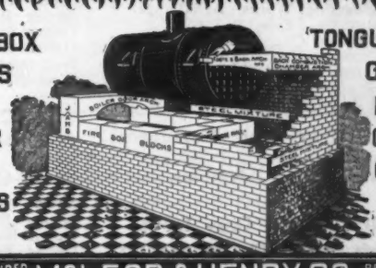

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CRANES (Charging).

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Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co. Alliance, O.
Whiting Foundry Equipment Co. Harvey, Ill.

CRANES (Electric Traveling).

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
Manning, Maxwell & Moore, New York, N. Y.
Marion Steam Shovel Co., Marion, O.
McIntosh-Hemphill & Co., Ltd., Pittsburg, Pa.
McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.
Shaw Electric Crane Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Gantry).

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Interstate Engineering Co., Bedford, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Variety Iron & Steel Works Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Hand Traveling).

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Detroit Hoist & Machine Co., Detroit, Mich.
Johnston & Jennings Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Hydraulic).

Alliance Machine Co., Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Jib).

Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
Johnston & Jennings Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.
Wood, R. D., & Co., Philadelphia, Pa.

CRANES (Locomotive).

Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
Interstate Engineering Co., Bedford, O.
McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Variety Iron & Steel Works Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Pneumatic).

Brown Hoisting Machinery Co., Cleveland, O.
Industrial Works, Bay City, Mich.
Northern Engineering Works, Detroit, Mich.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Special).

Alliance Machine Co., Alliance, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
Shaw Electric Crane Co., New York, N. Y.
United Engineering & Fdy. Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Steam and Pneumatic, Wire Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRUCIBLES.

Dixon, Joseph, Crucible Co., Jersey City, N. J.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

CUPOLAS.

Northern Engineering Works, Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Riter Conley Mfg. Co., Pittsburg, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPS (Grease).

Powell, Wm., Co., Cincinnati, O.

CUTTERS.

Landis Tool Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
Standard Engineering Co., Ellwood City, Pa.

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Bliss, E. W., Co., Brooklyn, N. Y.
Toledo Machine & Tool Co., Toledo, O.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

DAUBING (Cupola).

Obermayer, S., Co., Cincinnati, O.

DERRICKS (Hand Power).

Byers, John F., Machine Co., Ravenna, O.

DIES.

Cleveland Punch & Shear Works Co., Cleveland, O.
Jones & Lamson Machine Co., Springfield, Vt.
Long & Allstatter Co., Hamilton, O.
Marchant, Geo. F., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

DIE-PLATES and WORLDES (Steel, Wire Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

DIES (Forging).

Mesta Machine Co., Pittsburg, Pa.

DREDGES.

Marion Steam Shovel Co., Marion, O.
Thew Automatic Shovel Co., Lorain, O.

DRESSERS (Emery Wheel).

Chicago Screw Co., Chicago, Ill.
Norton Co., Worcester, Mass.

DRILL ROD.

Pittsburg Shafting Co. of Detroit, Detroit, Mich.

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Baird Machinery Co., Pittsburg, Pa.
Baker Bros., Toedo, O.
Cincinnati Bickford Tool Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
McCabe, J. J., New York City.
Motch & Merryweather Machinery Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Sibley Machine Tool Co., South Bend, Ind.
Vandyck Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

DRILLS (Electrical).

Cincinnati Electrical Tool Co., Cincinnati, O.
Independent Pneumatic Tool Co., Chicago, Ill.
U. S. Electrical Tool Co., Cincinnati, O.

DRILLS (Pneumatic).

Allen, John F., New York City.
Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.

DRILLS (Portable).

Cincinnati Bickford Tool Co., Cincinnati, O.
Cincinnati Electrical Tool Co., Cincinnati, O.
U. S. Electrical Tool Co., Cincinnati, O.

DRILLS (Radial).

U. S. Electrical Tool Co., Cincinnati, O.

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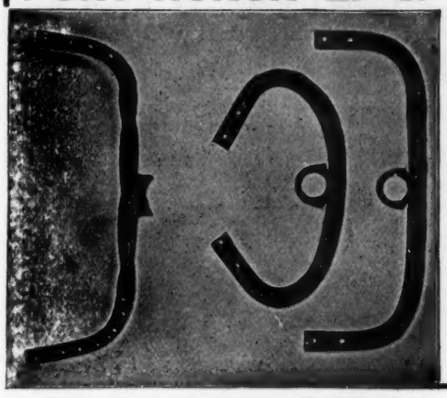

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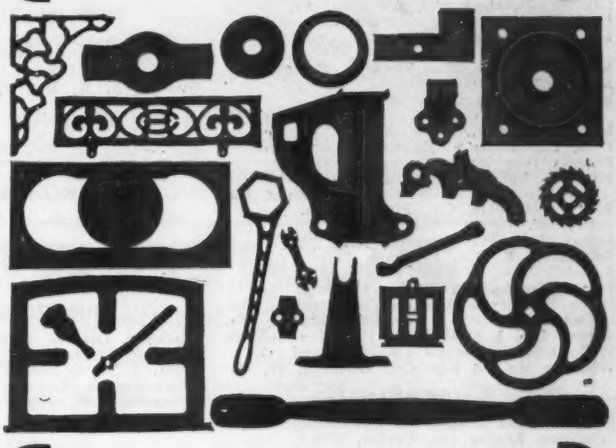

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Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

ECONOMIZERS (Fuel).

Green Fuel Economizer Co., Matteawan, N. Y.

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Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Blair Engineering Co., New York, N. Y.
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Bucyrus Steel Casting Co., Bucyrus, O.
Canton Boiler & Engineering Co., Canton, O.
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Eynon-Evans Mfg. Co., Philadelphia, Pa.
Farrar & Trefts, Buffalo, N. Y.
Garrett-Cromwell Engineering Co., Cleveland, O.
Jeffrey Mfg. Co., Columbus, O.
Johnston & Jennings Co., Cleveland, O.
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Kennedy, Walter, Pittsburg, Pa.
Ladd & Baker, Philadelphia, Pa.
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Lamond, David, & Son, Pittsburg, Pa.
Laughlin, Alex., & Co., Pittsburg, Pa.
McClintic-Marshall Construction Co., Pittsburg, Pa.
McClure, George W., Son & Co., Pittsburg, Pa.
McKee, Arthur G., Cleveland, O.
Meehan Boiler & Construction Co., Lowellville, O.
Morgan Engineering Co., Alliance, O.
Peck, Francis J., & Co., Cleveland, O.
Phoenix Iron Works Co., Meadville, Pa.
Pittsburg Valve Foundry & Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scholl, W. J., Co., Youngstown, O.
Seaver, John W., Cleveland, O.
Smythe, S. R., Co., Pittsburg, Pa.
Swindell, Wm., & Bros., Pittsburg, Pa.
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Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.
Variety Iron & Steel Works Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

ENGINES (Blowing).

Bruce-Macbeth Engine Co., Cleveland, O.
Wisconsin Engine Co., Corliss, Wis.

ENGINES (Gas and Gasoline).

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Cooper, C. & G., Mt. Vernon, O.
Farrar & Trefts, Buffalo, N. Y.
Independent Pneumatic Tool Co., Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
Wisconsin Engine Co., Corliss, Wis.

ENGINES (Hoisting).

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Browning, Victor R., Co., Cleveland, O.
Byers, John F., Machine Co., Ravenna, O.
Cooper, C. & G., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Mesta Machine Co., Pittsburg, Pa.
Wisconsin Engine Co., Corliss, Wis.

ENGINES (Pneumatic).

Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.

ENGINES (Pumping).

Wisconsin Engine Co., Corliss, Wis.

ENGINES (Steam).

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Columbus Iron & Steel Co., Columbus, O.
Cooper, C. & C., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Farrar & Trefts, Buffalo, N. Y.
Lake Erie Engineering Works, Buffalo, N. Y.
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Wellman-Seaver-Morgan Co., Cleveland, O.
Wickes Bros., Pittsburg, Pa.
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Morgan Construction Co., Worcester, Mass.

EQUIPMENT (Sand Blast).

Obermayer, S., Co., Cincinnati, O.
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Squires Steam Specialties,
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

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Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

FACINGS (Sea Coal).

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

FERRO-MANGANESE.

Blackwell, Geo. G., & Sons, Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Obermayer, S., Co., Cincinnati, O.
Rogers, Brown & Co., Cincinnati, O.

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Blackwell, Geo. G., & Sons Co., Ltd., Liverpool, Eng.
Mohr, J. J., & Son, Philadelphia, Pa.
Obermayer, S., Co., Cincinnati, O.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

FILES.

Barnett, G. & H., Co., Philadelphia, Pa.
Nicholson File Co., Providence, R. I.

FILLET (Leather and Wood).

Cleveland Galvanizing Works, Cleveland, O.
Obermayer, S., Co., Cincinnati, O.

FILTERS (Water or Oil).

Wright Mfg. Co., Detroit, Mich.

FITTINGS (Open-Hearth Steel Pipe).

United Engineering & Fdy. Co., Pittsburg, Pa.

FITTINGS (Pipe).

Flagg, Stanley G., & Co., Philadelphia, Pa.
Pittsburg Piping & Equipment Co., Pittsburg, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Scholl, W. J., Co., Youngstown, O.

FLOUR (Foundry).

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

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Fairview Fluor-Spar & Lead Co., New York

FORGES.

Rockwell Furnace Co., New York, N. Y.

FORGINGS.

American Iron & Steel Mfg. Co., Lebanon, Pa.
Bliss Co., E. W., Brooklyn, N. Y.
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Cleveland Punch & Shear Works Co., Cleveland, O.
Firth-Sterling Co., McKeesport, Pa.
Hathaway & Co., A. G., Cleveland, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Machinery Forging Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Ohio Forge Co., Cleveland, O.
Oliver Iron & Steel Co., Pittsburg, Pa.
Otis Steel Co., Cleveland, O.
Pittsburg Forge & Iron Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.
Toledo Machine & Tool Co., Toledo, O.

FORGINGS (Auto).

General Drop Forge Co., Buffalo, N. Y.
Ohio Forge Co., Cleveland, O.
Strieby & Foote Co., Newark, N. J.

FORGINGS (Copper and Alloy Steel).

General Drop Forge Co., Buffalo, N. Y.
Machinery Forging Co., Cleveland, O.
Wyman & Gordon, Cleveland, O.

FORGINGS (Car and Locomotive).

American Iron & Steel Mfg. Co., Lebanon, Pa.
Cleveland City Forge & Iron Co., Cleveland, O.
General Drop Forge Co., Buffalo, N. Y.
Pittsburg Forge & Iron Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.
Toledo Machine & Tool Co., Toledo, O.

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Consolidated Mfg. Co., Toledo, O.
General Drop Forge Co., Buffalo, N. Y.
Machinery Forging Co., Cleveland, O.
Steel Car Forge Co., Pittsburg, Pa.
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Wyman & Gordon Co., Cleveland, O., and Worcester, Mass.

FORGINGS (Light and Medium).

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Oliver Iron & Steel Co., Pittsburg, Pa.

FORGINGS (Machinery).

General Drop Forge Co., Buffalo, N. Y.
Machinery Forging Co., Cleveland, O.

FORKS AND HOES.

American Fork & Hoe Co., Cleveland, O.

FRAMES (Steel, Locomotive).

Union Steel Casting Co., Pittsburg, Pa.

FROGS AND SWITCHES (Industrial).

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Chase Foundry & Mfg. Co., Cleveland, O.
Wiener Co., Ernst, New York, N. Y.

FURNACES (Annealing).

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General Electric Co., Schenectady, N. Y.
Green Engineering Co., Chicago, Ill.
Kenworthy Engineering Co., Waterbury, Conn.
McClure, Son & Co., G. W., Pittsburg, Pa.
Rockwell, W. S., Co., New York, N. Y.
Rockwell Furnace Co., New York, N. Y.
Swindell & Bros., Wm., Pittsburg, Pa.

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Canton Boiler & Engineering Co., Canton, O.
Garrett-Cromwell Engineering Co., Cleveland, O.
Kennedy, Julian, Pittsburg, Pa.
Kennedy, Walter, Pittsburg, Pa.
Ladd & Baker, Philadelphia, Pa.
Lake Erie Engineering Works, Buffalo, N. Y.
Mackintosh, Hemphill & Co., Pittsburg, Pa.
McKee, Arthur, Cleveland, O.
McClure, Son & Co., G. W., Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Engineering Co., Alliance, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sharon Boiler Works, Sharon, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Smythe Co., S. R., House Bldg., Pittsburg, Pa.
Swindell & Bros., Wm., Pittsburg, Pa.
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Burns Oil-Fuel Furnace Co., Fort Plain, N. Y.
Kenworthy Engineering Co., Waterbury, Conn.
Laughlin & Co., Alex., Pittsburg, Pa.
Rockwell, W. S., Co., New York City.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Swindell & Bros., Wm., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES (Electrically Heated).

Bristol Co., Waterbury, Conn.

FURNACES (Forging).

Kenworthy Engineering Co., Waterbury, Conn.
National Machinery Co., Tiffin, O.
Rockwell Furnace Co., New York, N. Y.

FURNACES (Lead, Pot and Muffle Annealing, Wire Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES (Melting).

Kenworthy Engineering Co., Waterbury, Conn.
Rockwell, W. S., Co., New York City.
Whiting Foundry Equipment Co., Harvey, Ill.

FURNACES (Oil, Gas or Coke, Welded Chain Factories).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FURNACES (Reheating).

Green Engineering Co., Chicago, Ill.
Kenworthy Engineering Co., Waterbury, Conn.
Morgan Construction Co., Worcester, Mass.
Rockwell Furnace Co., New York City.

FURNACES (Spelter and Tinning, Wire Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GALVANIZING.

Cleveland Galvanizing Works Co., Cleveland, O.
Empire Iron & Steel Co., Niles, O.

GEARS.

Bilgram, Hugo, Philadelphia, Pa.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Foote Bros. Gear & Machine Co., Chicago, Ill.
Ganschow Co., Wm., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
Mesta Machine Co., Pittsburg, Pa.
Newark Gear Cutting Machine Co.,Newark,N.J.
New Process Rawhide Co., Syracuse, N. Y.
Nuttall, R. D., Co., Pittsburg, Pa.
Schultz, A. L., & Son, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

GEARS (Bevel).

Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.

GEARS (Cast Steel, Mach. Molded).

Mesta Machine Co., Pittsburg, Pa.
United Engineering & Fdy. Co., Pittsburg, Pa.

GEARS (Cut).

Mesta Machine Co., Pittsburg, Pa.
New Process Rawhide Co., Syracuse, N. Y.

GEARS (Rawhide).

New Process Rawhide Co., Syracuse, N. Y.

GEARS (Swinging).

Dake Engine Co., Grand Haven, Mich.

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General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

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Streng, Carlisle & Hammond Co., Cleveland, O.

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Dean Bros. Steam Pump Works, Indianapolis.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
McGowan Co., John H., Cincinnati, O.
Streng, Carlisle & Hammond Co., Cleveland, O.
Squires Steam Specialties.
Wood & Co., R. D., Philadelphia, Pa.

GRAPHITE.

Dixon Crucible Co., Jos., Jersey City, N. J.
Smith, J. D., Fdy. Supply Co., Cleveland, O.

GRATES.

Farrar & Trefts, Buffalo, N. Y.
Green Engineering Co., Chicago, Ill.
Lake Erie Engineering Works, Buffalo, N. Y.
Macbeth Iron Works Co., Cleveland, O.
Vulcan Iron Works Co., Toledo, O.

GRINDERS (Chain Die, Welded Chain Factories).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GRINDERS (Electric Bench—Center—Surface).

Cincinnati Electrical Tool Co., Cincinnati, O.
U. S. Electrical Tool Co., Cincinnati, O.

GRINDERS (Nail Machine Knife, Wire Nail Mills).

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Billings & Spencer Co., Hartford, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engineering Co., Chambersburg.
Erie Foundry Co., Erie, Pa.
Massillon Fdry. & Machine Co., Massillon, O.
Merrill Bros., Brooklyn, N. Y.
Michigan Mach. & Mfg. Co., Ypsilanti, Mich.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Toledo Machine & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mach. Co., Waterbury, Conn.
Wickes Bros., Pittsburg, Pa.

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Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
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Beaudry & Co., Inc., Boston, Mass.
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Bradley & Sons, C. C., Syracuse, N. Y.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Chambersburg Engineering Co., Chambersburg.
Cleveland Punch & Shear Works, Cleveland, O.
Johnston & Jennings Co., Cleveland, O.
Massillon Fdry. & Machine Co., Massillon, O.
Morgan Engineering Co., Alliance, O.
Toledo Mch. & Tool Co., Toledo, O.
Waterbury Farrel Fdy. & Mch. Co. Waterbury, Conn.

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Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
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Erie Foundry Co., Erie, Pa.
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Massillon Fdry. & Machine Co., Massillon, O.

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Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich,

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Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Browning, Victor R., Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
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McMyler Mfg. Co., Cleveland, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Northern Engineering Works, Detroit, Mich.
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Whiting Foundry Equipment Co., Harvey, Ill.

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Chisholm & Moore Mfg. Co., Cleveland, O.

HOISTS (Pneumatic).

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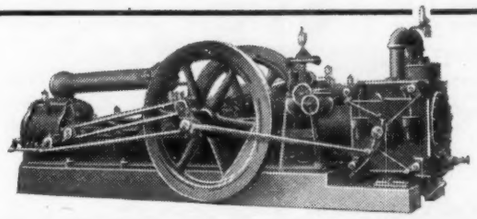

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Espen-Lucas Mach. Works, Philadelphia, Pa.
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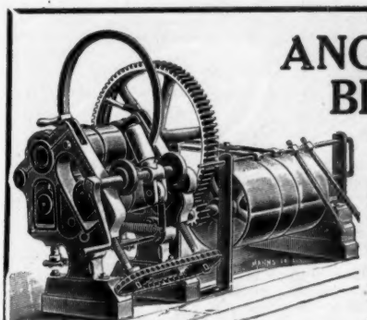

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Morgan Construction Co., Worcester, Mass.

MILLS (Wire Complete Equipment).

Morgan Construction Co., Worcester, Mass.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

MODELS (Made to Order).

Freeman Pattern Co., Cleveland, O.
Standard Pattern Co., Cleveland, O.

MOLDS (Ingot).

Carnegie Steel Co., Pittsburg, Pa.
Marshall Foundry Co., Pittsburg, Pa.
Union Foundry & Machine Co., Pittsburg, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Foundry & Machine Co., Youngstown, O.

MOTORS (Air).

Chisholm & Moore Mfg. Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Hoist & Machine Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

MOTORS (Electric D. C. & A. C.).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg.

NAILS.

American Steel & Wire Co., Chicago, Ill.
Bassett-Presley Co., Cleveland, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
LaBelle Iron Works, Steubenville, O.
Pittsburg Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

NUTS.

American Bridge Co., New York City.
American Iron & Steel Mfg. Co., Lebanon, Pa.
Bassett-Presley Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland, O.
Graham Nut Co., Pittsburg, Pa.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburg, Pa.
Oliver Iron & Steel Co., Pittsburg, Pa.
Phosphor-Bronze Smelting Co., Philadelphia, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

ORES (Chrome).

American Refractories Co., Chicago, Ill.
Blackwell & Sons Co., Ltd., Geo. G., Liverpool, Eng.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Stowe-Fuller Co., Cleveland, O.

ORES (Iron).

Blackwell, Sons & Co., Geo. G., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Corrigan, McKinney & Co., Cleveland, O.
Debevoise-Anderson Co., New York City.
Hanna, M. A., Cleveland, O.
Hillman & Son, J. H., Pittsburg, Pa.
Lea, J. Tatnall, & Co., Philadelphia, Pa.
LaBelle Iron Works, Steubenville, O.
Lake Erie Ore Co., Cleveland, O.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
Pickands, Mather & Co., Cleveland, O.
Tod-Stambaugh Co., Cleveland, O.

OVENS.

Kenworthy Engineering Co., Waterbury, Conn.

OVENS (Core).

Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Smith Fdry. Supply Co., J. D., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

PACKING.

Jenkins Bros., New York City.

PATTERNS.

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Bruce-Macbeth Engine Co., Cleveland, O.
Freeman Pattern Works, Toledo, O.
Lake Erie Engineering Works, Buffalo, N. Y.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Schultz, A. L., & Son, Chicago, Ill.
Standard Pattern Works, Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Foundry & Machine Co., Youngstown, O.

PATTERNS (Metal).

Canton Brass Co., Canton, O.

PENSTOCKS.

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Petroleum Iron Works, Sharon, Pa.
Struthers-Wells Co., Warren, Pa.

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New Process Rawhide Co., Syracuse, N. Y.

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Champion Rivet Co., Cleveland, O.

PINS (Pivot).

Champion Rivet Co., Cleveland, O.

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Lake Erie Boiler Works, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Mudge & Co., Edmund W., Pittsburg, Pa.
National Tube Co., Pittsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.
United Cast Iron Pipe & Foundry Co., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Arch).

Parkesburg Iron Co., Parkesburg, Pa.

PIPE (Riveted Steel).

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Canton Boiler & Engineering Co., Canton, O.
Farrar & Trefts, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Struthers-Wells Co., Warren, Pa.

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Bourne-Fuller Co., Cleveland, O.
Pittsburg Piping Equipment Co., Pittsburg, Pa.

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Pittsburg Piping Equipment Co., Pittsburg, Pa.
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Cincinnati Shaper Co., Cincinnati, O.
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Wilfong Bros., Philadelphia, Pa.

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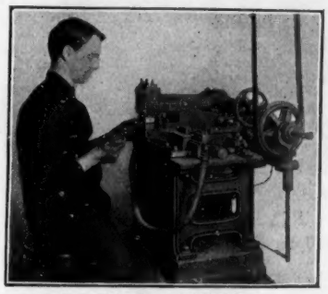

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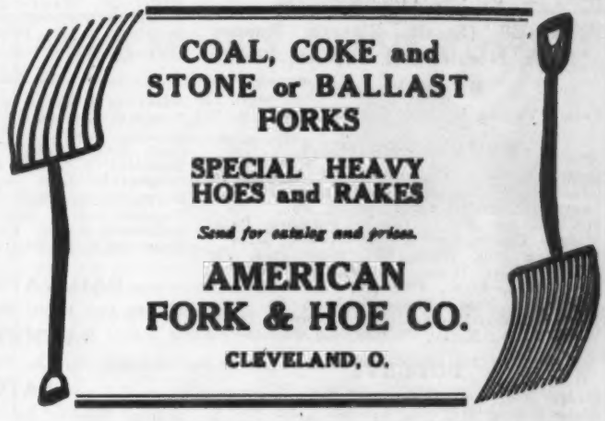

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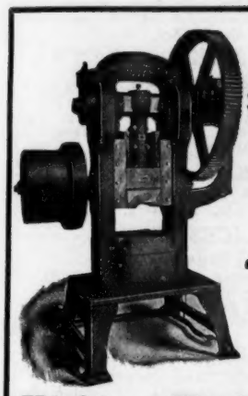

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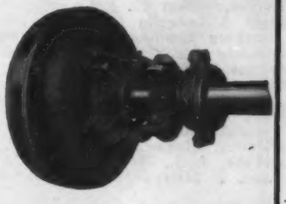

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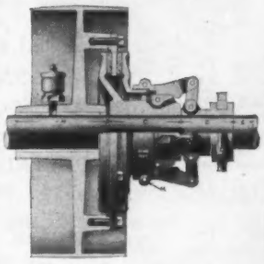

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Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

SAWS (Cold Metal).

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Espen-Lucas Machine Works, Philadelphia, Pa.
Ryerson, Joseph T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Vandyck Churchill Co., New York City.
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.

SAWS (Hot).

American Roll & Foundry Co., Canton, O.
Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
United Engineering & Foundry Co., Pittsburg.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SCREWS.

American Iron & Steel Mfg. Co., Lebanon, Pa.
Chicago Screw Co., Chicago, Ill.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Upson Nut Co., Cleveland, O.

SCREW-DRIVERS.

Billings & Spencer Co., Hartford, Conn.

SCREW STOCK.

Pittsburg Shafting Co. of Detroit, Detroit.

SEPARATORS (Magnetic).

General Electric Co., Schenectady, N. Y.
Paxson Co., J. W., Philadelphia, Pa.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

SEPARATORS (Steam or Oil).

Austin Separator Co., Detroit, Mich.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Squires Steam Specialties, Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

SHAFTING.

American Steel & Wire Co., Chicago, Ill.
Bassett-Presley Co., Cleveland, O.
Baird Machinery Co., Pittsburg, Pa.
Cumberland Steel Co., Cumberland, Mo.
Dodge Mfg. Co., Mishawaka, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., & Co., Boston, Mass.
Jones & Langhlin Steel Co., Pittsburg, Pa.
Pittsburg Shafting Co. of Detroit, Detroit.
Republic Iron & Steel Co., Pittsburg, Pa.
Wickes Bros, Pittsburg, Pa.

SHAPERS.

Baird Machinery Co., Pittsburg, Pa.
Cincinnati Shaper Co., Cincinnati, O.
Manning, Maxwell & Moore, Inc., New York.
McCabe, J. J., New York City.
Motch & Merryweather Machine Co., Cleveland, O.
Niles-Bement-Pond Co., New York City.
Vandyck Churchill Co., New York City.
Wickes Bros., Pittsburg, Pa.

SHAPES (Agricultural).

Buffalo Steel Co., Tonawanda, N. Y.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Inland Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.

SHEARS (Billet, Bloom and Slab).

Mesta Machine Co., Pittsburg, Pa.
Morgan Construction Co., Worcester, Mass.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Lever).

Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Scrap, Alligator, Wire and Wire Nail Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

SHEARS (Squaring).

Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEARS (Vertical).

Mesta Machine Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
United Engineering & Fdy. Co., Pittsburg, Pa.
Wheeling Mold & Fdy. Co., Wheeling, W. Va.

SHEETS (Corrugated).

American Sheet & Tin Plate Co., Pittsburg, Pa.
Edwards Mfg. Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Inland Steel Co., Chicago, Ill.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Niles Iron & Steel Co., Niles, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Black Steel).

American Sheet & Tin Plate Co., Pittsburg, Pa.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Thomas Steel Co., Niles, O.

SHEETS (Galvanized).

American Sheet & Tin Plate Co., Pittsburg, Pa.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., & Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Thomas Steel Co., Niles, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O

SHEETS (Iron and Steel).

American Sheet & Tin Plate Co., Pittsburg, Pa.
Bassett-Presley Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Edwards Mfg. Co., Cincinnati, O.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Kratzer, W. N., & Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Petroleum Iron Works Co., Sharon, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Taylor, N. & G., Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
Thomas Steel Co., Niles, O.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SHOVELS, SPADES AND SCOOPS.

Avery Stamping Co., Cleveland, O.
Obermayer, S., Co., Cincinnati, O.

SHOVELS (Steam).

Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Thew Automatic Shovel Co., Lorain, O.

SIFTERS (Sand).

Hanna Engineering Works, Chicago, Ill.
Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

SLABS.

La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., New York City.
United Steel Co., Canton, O.

SLABS (Sheet).

Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Mudge, Edmund W., & Co., Pittsburg, Pa.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPSTONE.

Obermayer, S., Co., Cincinnati, O.
Smith, J. D., Fdry. Supply Co., Cleveland, O.
Stevens, F. B., Detroit, Mich.

SPECIALTIES (Steam).

Cameron, A. S., Steam Pump Co., New York City.
Chaplin-Fulton Mfg. Co., Pittsburg, Pa.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Strong, Carlisle & Hammond, Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

SPELTER.

Illinois Zinc Co., Peru, Ill.

SPIKES.

American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel & Wire Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Republic Iron & Steel Co., Pittsburg, Pa.

SPIKES (Screw).

Pittsburg Forge & Iron Co., Pittsburg, Pa.
Steel Car Forge Co., Pittsburg, Pa.

SPLICES (Rail).

Carnegie Steel Co., Pittsburg, Pa.
Central Track Supply Co., Springfield, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
Republic Iron & Steel Co., Pittsburg, Pa.

STACKS.

American Bridge Co., New York City.
Canton Boiler & Engineering Co., Canton, O.
Farrar & Trefts, Buffalo, N. Y.
Meehan Boiler & Construction Co., Lowellville, O.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Struthers-Wells Co., Warren, Pa.

STAMPING (Sheet Metal).

Avery Stamping Co., Cleveland, O.

STAND-PIPES.

American Bridge Co., New York City.
Canton Boiler & Engineering Co., Canton, O.
Farrar & Trefts, Buffalo, N. Y.
Petroleum Iron Works Co., Sharon, Pa.
Sharon Boiler Works, Sharon, Pa.

STAPLES.

Youngstown Sheet & Tube Co., Youngstown, O.

STEEL.

American Bridge Co., New York City.
Bassett-Presley Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburg, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur Co., & Co., Boston, Mass.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
La Belle Iron Works, Steubenville, O.
Lockhart Iron & Steel Co., Pittsburg, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Pittsburg, Pa.
United Steel Co., Canton, O.
Wood, Alan, Iron & Steel Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

STEEL (Cold Rolled).

Pittsburg Shafting Co. of Detroit, Detroit, Mich.

STEEL (Drawn).

Pittsburg Shafting Co. of Detroit, Detroit, Mich.

STEEL (Structural).

American Bridge Co., New York City.
Bellefontaine Bridge & Steel Co., Bellefontaine, O.
Bourne-Fuller Co., Cleveland, O.
Buffalo Steel Co., Tonawanda, N. Y.
Carnegie Steel Co., Pittsburg, Pa.
Empire Iron & Steel Co., Niles, O.
Globe Rolling Mill Co., Cincinnati, O.
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Interstate Engineering Co., Bedford, O.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Kratzer, W. N., & Co., Pittsburg, Pa.
Lackawanna Steel Co., New York City.
McClintic-Marshall Constr. Co., Pittsburg, Pa.
Mudge, Edmund W., & Co., Pittsburg, Pa.
North Works, Chicago, Ill.
Republic Iron & Steel Co., Pittsburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Scully Steel & Iron Co., Chicago, Ill.
Variety Iron & Steel Works Co., Cleveland, O.

STEEL (Tool).

Bassett-Presley Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Firth-Sterling Co., Mckeesport, Pa.
Globe Rolling Mill Co., Cincinnati, O.
Harvey, Arthur C., Co., Boston, Mass.
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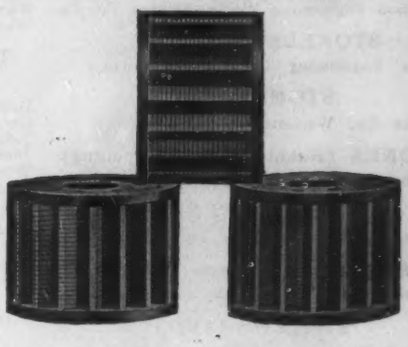

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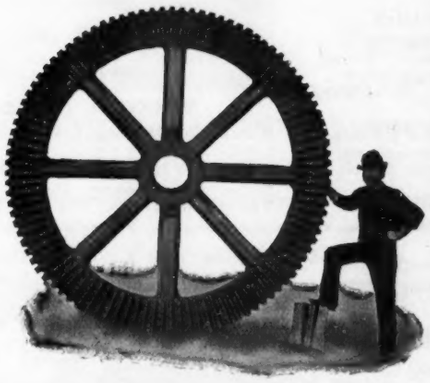

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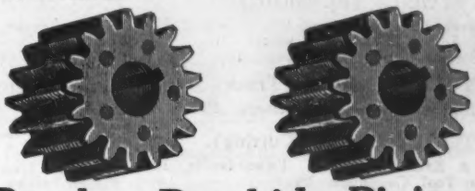

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General Electric Co., Schenectady, N. Y.

SWITCHES.

Central Track Supply Co., Springfield, O.

SWITCHES (Electrical).

Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

SWITCHES (Magnetic).

Electric Controller & Mfg. Co., Cleveland, O.

TABLES (Drawing).

Economy Drawing Table Co., Toledo, O.

TABLES (Rolling Mill).

Morgan Construction Co., Worcester, Mass.

TABLES (Turn).

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Chase Fdy. & Mfg. Co., Columbus, O.
Interstate Engineering Co., Bedford, O.
Northern Engineering Works, Detroit, Mich.
Ryerson, Jos. T., & Son, Chicago, Ill.

TANKS AND TOWERS.

Canton Boiler & Engineering Co. Canton, O.
Farrar & Trefts, Buffalo, N. Y.
Kratzer, W. N., & Co., Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O.
Newbold, R. S., & Son Co., Norristown, Pa.
Ohio Boiler Co., Girard, O.
Petroleum Iron Works Co., Sharon, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Scaife, Wm. B., & Sons Co., Pittsburg, Pa.
Sharon Boiler Works, Sharon, Pa.
Struthers-Wells Co., Warren, Pa.
Variety Iron & Steel Works Co., Cleveland, O.

TANKS (Water and Acid Storage, Wire Mills).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TELEPHONE AND TELEGRAPH POLE LINE MATERIAL.

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TOOLS (Molders').

Obermayer, S., Co., Cincinnati, O.

TOOLS (Pneumatic).

Independent Pneumatic Tool Co., Chicago, Ill.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

TOOLS (Railroad Track).

Oliver Iron & Steel Co., Pittsburg, Pa.

TOOLS (Thread Cutting).

Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Williams Tool Co., Erie, Pa.

TORCHES (Shop).

Dayton Malleable Iron Co., Dayton, O.
Obermayer, S., Co., Cincinnati, O.

TRACK (Industrial).

Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Central Track & Supply Co., Springfield, O.
Northern Engineering Works, Detroit, Mich.
Wiener Co., Ernst, New York, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

TRACK (Overhead).

Brown Hoisting Machinery Co., Cleveland, O.

TRAMRAILS (Overhead Systems).

Brown Hoisting Machinery Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION EQUIPMENT (Power).

Dodge Mfg. Co., Mishawaka, Ind.
General Electric Co., Schenectady, N. Y.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

TRANSMISSION EQUIPMENT (Rope).

Dodge Mfg. Co., Mishawaka, Ind.

TRAPS (Air).

Wright Mfg. Co., Detroit, Mich.

TRAPS (Steam).

Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
Squires Steam Specialties, Cleveland, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Wright Mfg. Co., Detroit, Mich.

TROLLEYS.

Browning, Victor R., Co., Cleveland, O.
Chisholm & Moore Mfg. Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Morgan Engineering Co., Alliance, O.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Smith, J. D., Fdry. Supply Co., Cleveland, O.

TRUCKS.

Jones & Laughlin Equipment Co., Harvey, Ill.
Wellman-Seaver-Morgan Co., Cleveland, O.
Youngstown Car Mfg. Co., Youngstown, O.

TRUCKS (Electrically Driven).

Westinghouse Machine Co., E. Pittsburg, Pa.

TRUCKS (Storage Battery).

Westinghouse Machine Co., E. Pittsburg, Pa.

TRUCKS (Wire Rod, Wire Mills).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUBES.

Bassett-Presley Co., Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Globe Rolling Mill Co., Cincinnati, O.
National Tube Co., Pittsburg, Pa.
Parkesburg Iron Co., Parkesburg, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Shelby Steel Tube Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBING (Automobile).

National Tube Co., Pittsburg, Pa.
Pittsburg Shafting Co. of Detroit, Detroit.
Shelby Steel Tube Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBING (Seamless Steel).

Ivins, Ellwood, Tube Works, Philadelphia, Pa.
Pittsburg Shafting Co. of Detroit, Detroit.

TUBING (Tool Steel).

Ivins, Ellwood, Tube Works, Philadelphia, Pa.

TURBINES (Steam).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., Pittsburg, Pa.

TURNBUCKLES.

American Iron & Steel Mfg. Co., Lebanon, Pa.
Bassett-Presley Co., Cleveland, O.
Cleveland City Forge & Iron Co., Cleveland, O.
Globe Rolling Mill Co., Cincinnati, O.
Graham Nut Co., Pittsburg, Pa.
Jones & Laughlin Steel Co., Pittsburg, Pa.
Merrill Bros., Brooklyn, N. Y.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Pittsburg, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Steel Car Forge Co., Pittsburg, Pa.
Upson Nut Co., Cleveland, O.

VALVES.

Eynon-Evans Mfg. Co., Philadelphia, Pa.
Jenkins Bros., New York City.
McGowan, John H., Co., Cincinnati, O.
Pittsburg Valve, Foundry & Construction Co., Pittsburg, Pa.
Pittsburg Piping & Equipment Co., Pittsburg, Pa.
Powell, Wm., Co., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.

VALVES (Back Pressure and Check).

Jenkins Bros., New York City.
McGowan, John H., Co., Cincinnati, O.
Powell, Wm., Co., Cincinnati, O.
Strong, Carlisle & Hammond Co., Cleveland, O.
Squires Steam Specialties, Cleveland, O.

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Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

VALVES AND FITTINGS. (Hydraulic).

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VALVES (Lever and Throttle).

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Powell, Wm., Co., Cincinnati, O.

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Strong, Carlisle & Hammond Co., Cleveland, O

VALVES (Regrinding).

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Merrill Bros., Brooklyn, N. Y.
Wyman & Gordon Co., Cleveland, O.

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American Iron & Steel Mfg. Co., Lebanon, Pa.
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Milton Mfg. Co., Milton, Pa.
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Oliver Iron & Steel Co., Pittsburg, Pa.
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WELDING (Electric).

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Toledo Electric Welding Co., Toledo, O.

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Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

WELDERS (Electric).

Thomson Electric Welding Co., Lynn, Mass.
Toledo Electric Welding Co., Toledo, O.

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Norton Co., Wocester, Mass.

WHEELS (Grinding).

Norton Co., Wocester, Mass.
Vitrified Wheel Co., Westfield, Mass.

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Pittsburg Steel Co., Pittsburg, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Cable and Rope).

American Steel & Wire Co., Chicago, Ill.
Pittsburg Steel Co., Pittsburg, Pa.

WIRE (Grilles).

American Steel & Wire Co., Chicago, Ill.
Globe Rolling Mill Co., Cincinnati, O.

WIRE AND CABLE (Insulated).

General Electric Co., Schenectady, N. Y.

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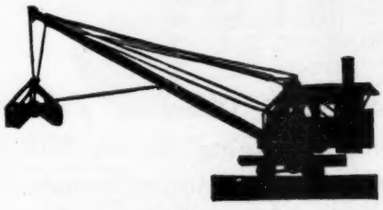

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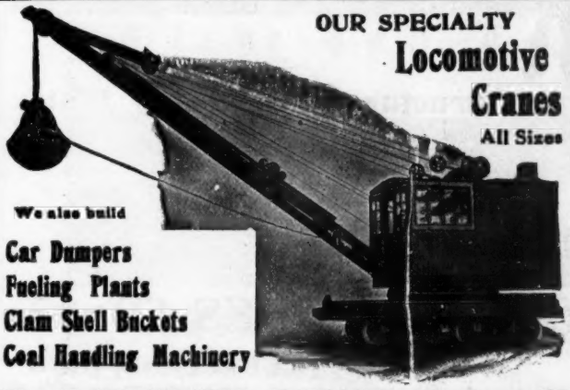

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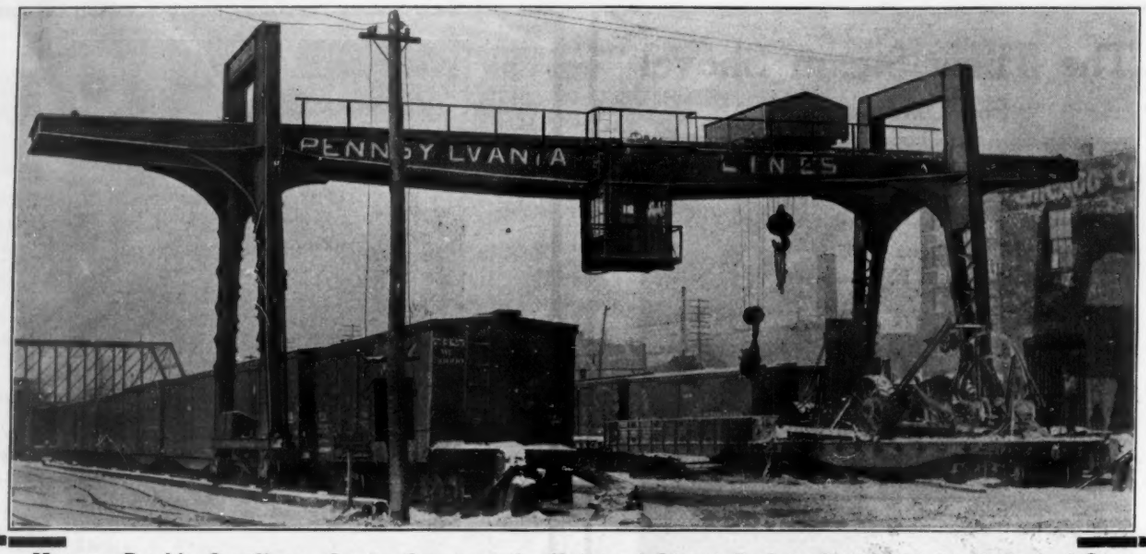

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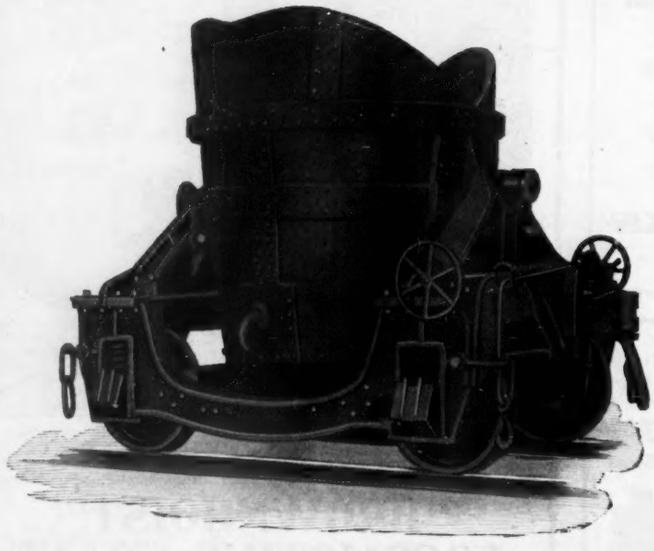

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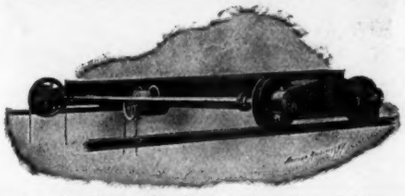

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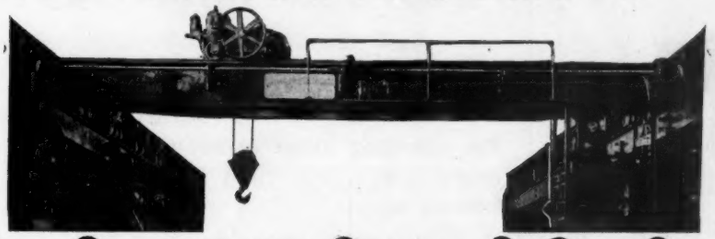

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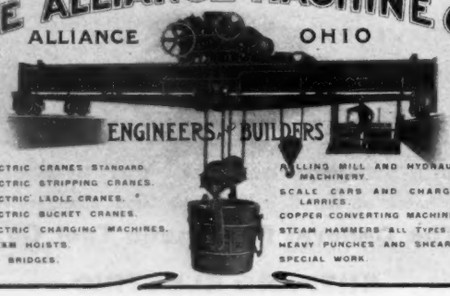

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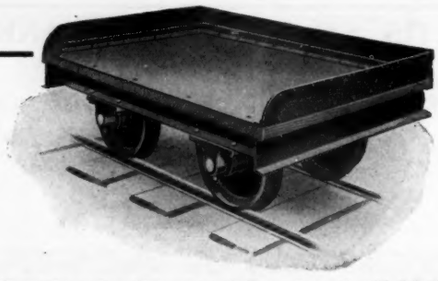

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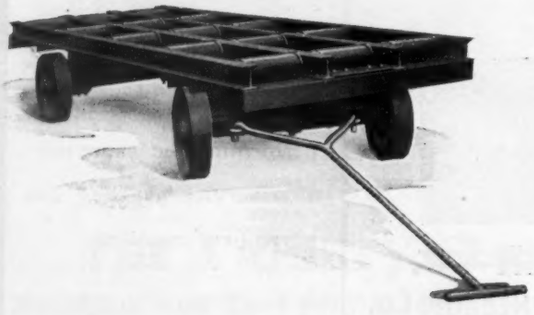

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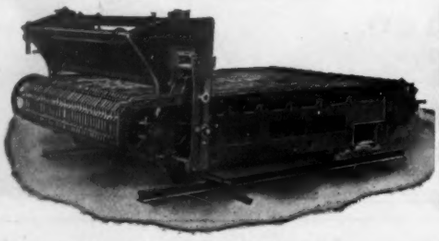

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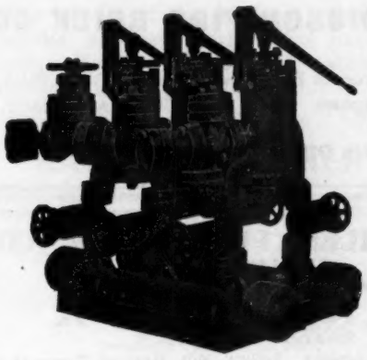

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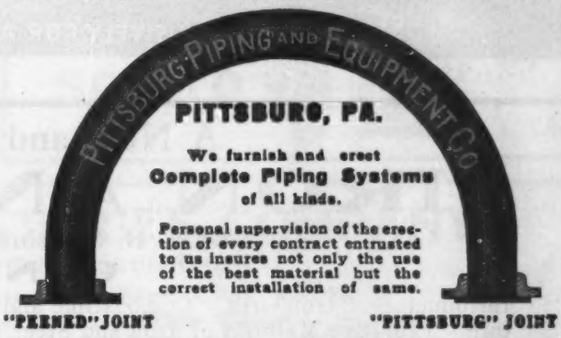

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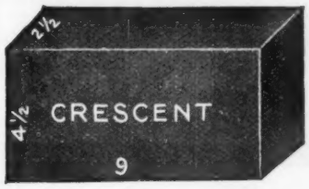

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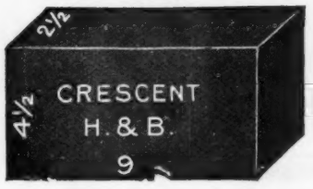

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ALLOYS
FERRO-MANGANESE
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FERRO-SILICON
10 % to 90 %
FERRO-PHOSPHORUS

OFFICES:

LOUISVILLE, Lincoln Savings Bank Bldg.
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ST. LOUIS, Pierce Bldg.
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PITTSBURG, German Nat'l Bank.
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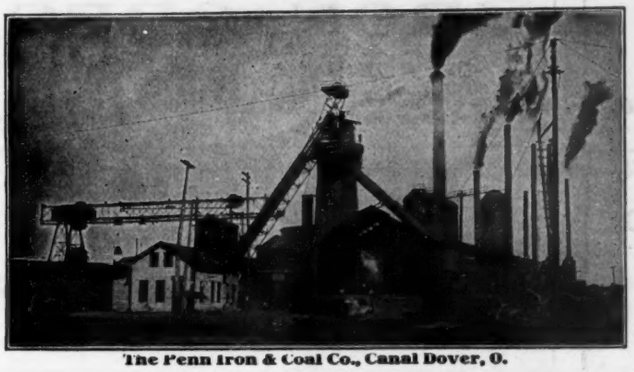
—Soft— Stove manufacturers say —Fluid—

"CHERRY VALLEY" FOUNDRY IRON

is the only iron they can use for their entire mixture.

UNITED IRON & STEEL COMPANY

People's Building PITTSBURGH, PA.



The Penn Iron & Coal Co., Canal Dover, O.

At Canal Dover, O.

We make the celebrated
Tuscarawas and Dover Foundry
Malleable,
Basic and
Bessemer Iron

Inquiries Solicited.

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Lake Superior Charcoal Pig Iron

BRANDS

PIONEER, ANTRIM, ELK RAPIDS, CHAMPION,
MARQUETTE, MICHIGAN, EXCELSIOR, PINE LAKE.

Particularly adapted for the manufacture of Car Wheels, Cylinders, Malleables and all foundry Castings, where great strength is required.

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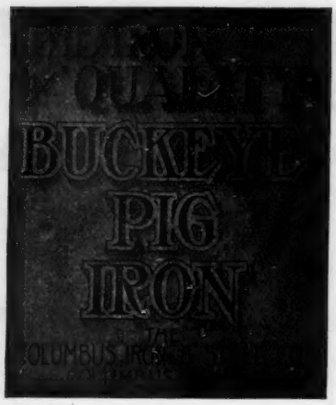

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IRON ORE
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The Tod-Stambaugh Co. **IRON ORES**
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PIG IRON COKE
FERRO MANGANESE FERRO SILICON

FAIRVIEW FLUOR SPAR & LEAD CO.
Mines: Fairview Landing, Illinois. Sales Office: 38 Park Row, New York City.

It is no longer necessary to use inferior Fluor-Spar. Having now an annual capacity of 50,000 tons we are prepared to furnish promptly

GRAVEL—For Steel Mills, running 90% and up C-F and not over 4% Silica.
LUMP—For Foundry use, running 94% and up C-F and less than 3% Silica.
GROUND—For Manufacturers of Hydro Fluoric Acid—Glass and Enamel Ware manufacturers, running 99% and up C-F and not over 0.50% Silica.

Prices are right. Let us send our Sales Manager to you. We want your contract.

Address: **JOHN MULHOLLAND, President,** 38 Park Row, New York City

TENNESSEE COAL, IRON & RAILROAD COMPANY

PIG IRON
FOUNDRY—FORGE—BASIC
"DeBardeleben," "Eureka," "South Pittsburg," "Ensley," "Alice."

OPEN HEARTH STEEL
Rails, Blooms, Billets, Slabs, Bars
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Chemists, Assayers, Metallurgists, Mining and Civil Engineers
Examination, Reports and Surveys of Mining Properties.
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Iron Ore sampled at Lake Ports, Furnaces and Mines.
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STANDARD CONNELLSVILLE COKE
Furnace Foundry Crushed
CEROME ORE INGOT MOLDS IRON CASTINGS

Inspected Foundry Irons
You rarely find so successful a pair
Hector & Clinton
Soft Strong Uniform and Fluid
Clinton Iron & Steel Co.
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"Shelby" Charcoal Carwheel Iron.
THE HAMMOND-BYRD COMPANY
BIRMINGHAM, ALA.
Sales Agents Shelby Iron Company.
Dealers in Southern Foundry Iron, Carwheel Iron, Coke and Coal.
"Warm Blast" foundry coke iron, "Imperial" Brand, our specialty.

DE CAMP BROS. & YULE
IRON, COAL AND COKE CO.
St. Louis - - Chicago
PIG IRON COKE SMITHING COAL FERRO-MANGANESE, ETC.
Exclusive Agents for Leading Brands

"JAMISON" SELECTED FOUNDRY COKE

Not how cheap, but HOW GOOD. We respectfully submit that this question is worth the Foundryman's most serious consideration, and a saving of 15 or 25 cents per ton on the Coke may mean a totally different result in the cost of your Castings.

Improvement is the order of the day with Jamison. 60 determinations from our shipments within the past two months showed this average, viz.:

Ash 10.04, Sulphur .86

Our constant aim is to *Make Better Coke* regardless of cost. February, 1909, 72-Hour shipments of 19,000 tons, proves that our efforts are appreciated by our valued trade.

Won't you give us a chance to tell you more about this Coke?

JAMISON COAL & COKE CO.

Frick Building Annex, Pittsburg, Pa.

DEBEVOISE-ANDERSON CO.

95 Liberty St., NEW YORK CITY

Pig Iron COKE Coal

WASHINGTON CONNELLSVILLE COKE

FOUNDRY COKE. *Efficiency* in Foundry Coke (yield of iron per ton of coke) and *Strength of Coke* are very important factors in using coke. Many cokes are low in sulphur, but on account of weak structure cannot produce high yield of iron per ton of coke. Washington 72 Hour Foundry Coke is low in sulphur and produces superior results in the cupola.

WASHINGTON CRUSHED COKE is the best.
LOW SULPHUR STOCK COKE for Heating.

WASHINGTON COAL & COKE CO.
Sales Office 7 Wood St.
Pittsburgh, Pa.

Bessemer Coke Company

Offices: Lewis Block PITTSBURG, PA.

Manufacturers of

CONNELLSVILLE COKE

Furnace, Foundry and Crushed Coke

CAPACITY, 100 CARS DAILY

INDIVIDUAL CARS

Mines and Ovens in Connellsville region.

Direct connections with all the railroads entering the region.

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Pig Iron--Coke

First National Building,
CINCINNATI, O.

THE UPSON NUT CO.

Cleveland, Ohio

Makers of Foundry Pig Iron

WALTER-WALLINGFORD & CO.

PIG IRON & COKE

CINCINNATI PITTSBURGH

Mitchell-Diggins Iron Co.

Charcoal Pig Iron

Cadillac, Mich.

STEWART IRON COMPANY, LIMITED

Perry Payne Bldg., CLEVELAND, OHIO.

Manufacturers of

LOW PHOSPHORUS PIG IRON

Stand. Bess. Pig Iron Low Phos. Melting Bars Coke

STEWART PORTLAND CEMENT

Works at Sharon, Pa.

The THOMAS FURNACE CO.

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Makers of FOUNDRY PIG IRON

Robesonia Low Phosphorus Pig Iron

J. TATNALL LEA & CO., *Sole Agents,*

STEPHEN GIRARD BUILDING

19 South 12th St. Philadelphia

WRITE US

FOR ANY BOOK ON MECHANICAL SUBJECTS.

The Iron Trade Review

Cleveland.

REBUILT ENGINES and BOILERS

The cleanest and most thoroughly rebuilt.

All our own and in stock. Not scattered everywhere and merely listed.

ENGINES—CORLISS:—20 x 48 Wheelock, 20 x 42 Allis, 18 x 42 Hamilton, 16 x 42 Lane & Bodley, 14 x 36 Lane & Bodley, 14 x 24 Wright, 12 x 30 Allis, etc.

ENGINES—AUTOMATIC:—16 x 32 Buckeye, 15 x 14 Erie, 14¼ x 16 Buckeye, 14½ x 14 Ball & Wood, 13½ x 15 Taylor, 13 x 16 Erie, 12 x 14 Green, 12 x 12 N. Y. Safety, 10 x 10 Fisher, 9½ x 12 Leffel, 8 x 10 Allfree, etc.

ENGINES—THROTTLING:—18 x 24 Erie, 16 x 20 Chandler & Taylor, 16 x 18 Erie, 14 x 24 Atlas, 13 x 16 Chandler & Taylor, 14 x 14 Lewis, Vertical, 10 x 16 Owens, Lane & Dyer, 10 x 12 Industrial, 9 x 12 Ajax, 8 x 12 Climax, 7 x 12 H. S. & G., 6 x 8, Clark, etc.

BOILERS—STATIONARY:—72 x 18 High Pressure, 72 x 18 Standard, 72 x 16, 66 x 16, 60 x 20, 60 x 16, 54 x 16, 54 x 14, 54 x 12, 48 x 16, 48 x 14, 44 x 14, 40 x 12, 40 x 9, 36 x 16, 36 x 10, etc.

BOILERS—FIRE BOX:—80, 60, 50, 40, 35, 30, 25, 20, 16, 12, 10 and 8 H. P., etc.

BOILERS—VERTICAL:—50, 40, 35, 30, 25, 20, 16, 12, 10, 8, 5 and 3 H. P., etc.

HEATERS:—All sizes, Open and Closed.

PUMPS:—All sizes, Single and Duplex.

LATHES:—17 x 8 Lodge & Barker; 60" Stevens Pulley.

PLANER:—32 x 30 x 10 ft. New Haven, Single Head.

MILLER:—DUPLEX BRASS MILLER.

TOOL GRINDER:—Springfield.

SAW MILLS, LATH MILLS, EDGERS, CUT-OFF SAWS, TANKS, BLOWERS, EXHAUSTERS, etc. Write for list.

Also full assortment of new machinery.

Sole manufacturers of the celebrated "LEADER" INJECTORS and JET PUMPS. Send for circular.

THE RANDLE MACHINERY CO.
1747 Powers St.
CINCINNATI, OHIO

Refitted Machine Tools

BORING MACHINES
(1) 37 in. Bridgeport—(1) head

CENTERING MACHINE
(1) 5 in. D. E. Whitton 2-spindle

DRILL PRESSES
(1) Dallet Portable
(1) 6-spindle Quint turret
(1) 32 in. Bement-Miles

DRILL PRESSES, Radial
(1) 42 in. Dreses Radial
(1) 42 in. Dreses Radial

GEAR CUTTERS
(1) Grant-Lees hobbing machine
(1) 30 in. x 8 in. Brainard Spur
(1) 36 in. x 9 in. x4p Gould & Eberhardt
(1) 36 in. x9 in. x5p Gould & Eberhardt
(1) 48 in. x10 in. x3p Gould & Eberhardt
(1) 60 in. x11 in. x3p Gould & Eberhardt

GRINDERS
(1) "A" Yankee Drill Grinder
(1) "PO" Yankee Drill Grinder
(1) Leland & Faulconer, wet

HAMMERS
(1) 60 lb. Bradley, cushion helve

LATHES
(1) 14 in. x 5 ft. Windsor, friction countershaft
(1) 14 in. x 6 ft. Le Blond, quick change gear
(1) 14 in. x 8 ft. Flather
(1) 16 in. x 6 ft. Reed, belt feed, plain rest
(1) 16 in. x 6 ft. Lodge & Shipley quick change gear
(1) 18 in. x 6 ft. Lodge & Shipley, quick change gear
(1) 20 in. x 8 ft. Flather, comp. rest
(1) 26 in. x 10 ft. Lodge & Shipley, quick change gear
(1) 22 in. x 12 ft. Lodge & Shipley, quick change gear
(1) 22 in. x 12 ft. Walcott
(1) 24 in. x 10 ft. Lodge & Barker
(1) 24 in. x 12 ft. Lodge & Shipley, quick change gear
(1) 24 in. x 16 ft. Lodge & Shipley, quick change gear
(1) 26 in. x 12 ft. Reed
(1) 27 in. x 14 ft. Lodge & Shipley, quick change gear

LATHES—POLISHING
(1) No. 3 Diamond, 32 x 1 1-4 spindle
(1) No. 7G Diamond, 46 x 1 1-4 spindle

MILLING MACHINES
(1) No. 3 Cincinnati; plain, all feeds
(1) No. 4 Cincinnati, all feeds, plain
(1) 48 in. x 24 in. x 6 ft. Ingersoll, slab

PLANERS
(1) 10 in. Bush crank
(1) 20 in. x 20 in. x 4 ft. Wheeler, 1 head
(1) 25 in. x 25 in. x 8 ft. Cincinnati, 2 heads
(1) 36 in. x 36 in. x 8 ft. Cincinnati, 2 heads
(1) 36 in. x 36 in. x 8 ft. Cincinnati, 2 heads. Variable speed box
(1) 36 in. x 36 in. x 8 ft. Detrich & Harvey, 3 heads, supplemental rolling table
(1) 36 in. x 36 in. x 10 ft. Gray, 1 head
(1) 42 in. x 36 in. x 8 ft. Cincinnati, 2 heads
(1) 42 in. x 36 in. x 14 ft. Cincinnati, 2 heads

PRESSES
(2) No. 20 Bliss
(1) DG No. 4 Ferracute
(1) No. 62 Toledo
(1) No. 3 Greenerd arbor

SAWS
(1) 3 1-2 in. Burr
(1) 6 in. Newton
(1) Miller-Falls Hack
(1) 36 in. Crescent band

SHAPERS
(1) 14 in. Lodge & Davis
(1) 16 in. Gould & Eberhardt
(1) 18 in. Steptoe
(1) 20 in. Hendey
(1) 24 in. Gould & Eberhardt
(1) 24 in. Hendey
(1) 24 in. Potter & Johnson
(1) 26 in. Cincinnati, triple geared
(1) 26 in. Hendey
(1) 32 in. Gould & Eberhardt
(1) 34 in. Walcott, shifting belt

TURRET LATHES
(1) No. 5 Warner & Swasey
(1) 22 in. Bullard "E" machine
(1) 26 in. Universal, chuck fitted

THE MOTCH & MERRYWEATHER MACHINERY CO.
707-715 Lakeside Ave. N. W., Cleveland, Ohio
Detroit Br'ch: 1105 Majestic Bldg. Cincinnati Br'ch: 1214 1st N't'l B'k Bldg

Frogs & Switches

ALSO

LIGHT RAILS, SPLICE BARS, SPIKES & BOLTS, SWITCHSTANDS, RAIL BRACES,

Quick Shipments of Short Orders.

CAR PUSHERS, DERAILERS, HEAVY CHAIN, PLATES 12' to 36' CUT TO SKETCH.

CENTRAL TRACK SUPPLY COMPANY, Springfield, O.

C. A. GRAY PLANER

60" x 60" x 18',--3 heads

RADIAL DRILL, 5' ARM, FULL UNIVERSAL EXTRA BOX TABLE, both tools practically new.

WM. WARD MACHINERY CO.
610 House Bldg. Pittsburg, Pa.

Bolt, Nut, Spike, Chain or any other Industry working Bar Iron wanted by Rockaway, N. J.

To an established business of such character, desiring to change its location, or to such an enterprise about to be started, special inducements will be offered to locate at Rockaway, New Jersey.

ADDRESS:
PRESIDENT, BOARD OF TRADE,
ROCKAWAY, NEW JERSEY

FOR SALE

POWER PLANT EQUIPMENT

AT PANTHER, W. VA.

1 Power House 40' x 70'.
2 175 H. P. Wickes hor. Water Tube boilers, with stack.
1 22" x 48" L. H., heavy duty Allis Corliss engine.
1 10" x 5" x 18" single cylinder pump.
1 6" x 4" x 6" Miller duplex pump.
1 500 H. P. Wickes open feed water heater.

AT SOUTH BEND, IND.

2 20" & 36" x 48" Cooper Cross comp. Corliss engines.
3 250 H. P. Wickes vertical water tube boilers.
1 600 K. W. Engine type, 2400 volt, Westinghouse generator.
1 100 K. W., 550 volt, G. E., direct-current generator.
2 C. & G. Cooper belted walking beam condensers.
1 10" x 6" x 12" Knowles No. 7 single cyl. pump.
1 7½" x 4½" x 10" Blake duplex pump.
1 5¼" x 3¾" x 5" Snow duplex pump.
2 47½" x 120' heavy double leather belts.

We offer the above for immediate shipment from their present locations. Everything is in good order and will be sold right.

WICKES BROTHERS
NEW YORK PITTSBURG SAGINAW, MICH.

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Advertisements for "Positions Wanted" and "Positions Vacant" inserted at the rate of 25 cents a line. All other advertisements under classified headings 40 cents a line for each insertion

Any advertisement appearing in the liner columns of THE IRON TRADE REVIEW, will be given one insertion free of charge in PENTON'S LIST, and when such advertisement is one that would be of interest to the foundry trade, it will likewise be given one insertion free of charge in THE FOUNDRY

POSITIONS VACANT.

PRACTICAL AND EXPERIENCED SUperintendent wanted for sheet iron and steel plate construction shop in Ohio. Must be capable of inaugurating. up-to-date, ingenuous, systematic and practical shop methods for reducing cost of production and increasing output. Give reference. age, experience and salary desired. A very good opportunity for the right man. Address Box 486, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

FOREMAN WANTED FOR IRON FOUNdry. Must be accustomed to heavy work. Mackintosh, Hemphill & Co., 12th & Etna Sts., Pittsburgh, Pa. I.T.R.

FOREMAN FOR BOILER SHOP NEAR Pittsburg. Must be experienced in all classes of plate work and preferably in structural work also. A first-class opening for brains and ability. Give full particulars. Replies strictly confidential. Address Box 481, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

SUPERINTENDENT WANTED; PRACTIcal man, experienced in rolling mill practice and use of scrap to take charge of rolling mill, embracing 9 in. and 18 in. trains, spike and track bolt departments. Apply with reference, stating age and salary expected to Box 476, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

WE WANT A SOBER, INDUSTRIOUS, non-union boiler maker for repair work; one who is willing to invest some money in repair work business. Prefer man with family, to make this place his home.—Write to Elizabeth City Iron Works & Supply Co., Elizabeth City, N. C. p.

EXPERIENCED MAN ON AUTOMOBILE cylinder molds and cores wanted, who has been foreman, assistant foreman or workman. Thorough knowledge required. State experience and qualifications. Address Box 465, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

FOREMAN WANTED FOR MODERN UPto-date radiator foundry, capable of handling men to advantage; state age, experience, wages, etc. Address Box 92, PENTON'S LIST, Cleveland, O. p.
Cleveland, O.

SOLICITOR FOR A GRAY IRON FOUNdry, also a foreman, who is acquainted with automobile work and light gray iron castings. Good wages, steady employment for both. Address Box 480, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

FOUNDRY FOREMEN AND OTHERS wanted to increase their earning capacity 25 to 50 per cent by taking a course in the mixing of irons with the Milwaukee Correspondence Schools, Goldsmith Bldg., Milwaukee, Wis.

POSITIONS WANTED,

POSITION DESIRED AS SUPERINtendent or assistant superintendent of farm implement concern by practical, wide-awake married man 35 years of age—expert in designing and manufacturing farm implements—draftsman, patternmaker and foundryman—four years with the International Harvester Co., 15 years with other important farm implement concerns. References unquestionable. Address Box 85, PENTON'S LIST, Cleveland, Ohio. p.

POSITION WANTED AS SUPERINTENDent or master mechanic by young man 34 years old. Mechanical experience on rolling mill and furnace work, electric cranes, ore handling machinery, locomotive and stationary engines, government work, etc. Executive ability, character and integrity the best. Address Box 91, PENTON'S LIST, Cleveland, O. p

AS SUPERINTENDENT BY A MAN thoroughly experienced in all departments of a brass concern in the manufacture of valves, steam specialties and plumbers' supplies. Can handle men to best advantage. Familiar with modern and systematic methods of producing best results in above lines. Have unquestionable references as to character, ability, etc. Address Box 584, THE FOUNDRY, Cleveland, O.

POSITION WANTED BY MACHINE patternmaker, age 36, married, sober and steady; 15 years' experience, past three years assistant foreman in large plant in Philadelphia. Competent in handling men and drafting—willing to work. A-1 references as to character and ability. Eastern Pennsylvania preferred. Address Box 83, PENTON'S LIST, Cleveland, O. p.

AS ASSISTANT TO FOUNDRY FOREman in some small jobbing foundry. Have had two years' experience on machinery molding and understand cupola management and iron mixing. Will be great help to any foundry foreman. Can do stenography work. Object in seeking position is to get a good knowledge of foundry work. Salary no object. Address Box 589, THE FOUNDRY, Cleveland, Ohio.

PROGRESSIVE YOUNG MAN IS OPEN to engagement as foundry foreman; thoroughly experienced in every detail of modern foundry. On light to medium weight gray iron castings can mix by fracture or analysis; energy to hustle and ability to get results at minimum cost. Can furnish references to those actually interested. Address Box 485, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

A MACHINERY SALESMAN, KNOWS the trade in New York, Boston and eastern states; has done a million and a half of business in seven years; understands up-to-date business and advertising methods; competent to manage general sales department or branch office; open to engagement on salary and commission basis. Address Box 473, THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

BY YOUNG MARRIED MAN, FORMERly purchasing agent for large railway equipment company, especially experienced in buying iron and steel and their products, also other material used in manufacturing railway equipment. Thoroughly familiar with trade. Can systematize detail work. Address Box 437, THE IRON TRADE REVIEW, Cleveland, O.

MR. MAKER. DO YOU WANT A REPresentative abroad to sell your machinery or steel products? If so, communicate with Mechanical and Metallurgical Engineer, care THE IRON TRADE REVIEW, Cleveland, O. Only reliable firm considered. I.T.R.

BUSINESS OPPORTUNITIES.

AN UP-TO-DATE FOUNDRY AND MAchine shop for sale, completely equipped, in daily operation with profit. Located in one of the best towns in Oklahoma, with excellent shipping facilities. Best of reasons for selling. Information cheerfully furnished. Address Business Opportunity, care PENTON'S LIST, Cleveland, O. p.

WE WOULD LIKE TO NEGOTIATE with some practical party controlling a useful patented article, to either buy or manufacture same on a royalty basis, party to assist in its manufacture. Unless you mean business do not answer. Currier-Koeth Mfg. Co., Coudersport, Pa. p.

FOUNDRIES WISHING A SPECIALTY in which there are large profits, write us at once. Address the Ashland Iron Works Co., Ashland, O. p.

WILL INVEST $15,000 IN GOOD PAYing manufacturing business and engage actively in same. Address "Ability," care THE IRON TRADE REVIEW, Cleveland, O. I.T.R.

BLOWERS FOR SALE.

BLOWER BARGAINS, NO. 6 ROOT, NO. 6 Baker Pressure Blowers, $250.00 each, replaced by a larger machine in new foundry. The Whitin Machine Works, Whitinsville, Mass. p.

ENGINES FOR SALE.

FOR SALE—ONE 30 H. P. STEAM ENgine, 9 x 12, built by Taylor & Chanler, slide valve, without fly wheel. The Turner Brass Works, Sycamore, Ill. p.

FOR SALE—ONE 30 H. P. STEAM engine, cylinder 9 x 12, built by Taylor & Chanler, slide valve, direct connected to 7½ foot x 4 foot Green Fuel Economizer Co. exhaust fan—Will sell together or separate. The Turner Brass Works, Sycamore, Ill. p.

WASHERS "SPECIAL SIZES."

In any quantity, metal or fibre. Dies, Stamping and Screw Machine Work. Quadriga Mfg. Co., 18 So. Canal St., Chicago, Ill. p.

FOR SALE, MISCELLANEOUS

STEAM PUMPS—NEW AND SECOND hand pumps of all sizes for sale cheap, steam, power, centrifugal and deep well pumps. If interested in the latest and best style of pumps, write for book and catalog. We manufacture pumps of all sizes for every duty. Columbus Steam Pump Works Co., Columbus, O. p.

FOR SALE—ONE 7½ FOOT X 4 FOOT exhaust fan, built for Green Fuel Economizer Co. For further particulars address The Turner Brass Works, Sycamore, Ill. p.

FOR SALE CHEAP, ONE BULL DOZER nearly new; for particulars write Clark & Norton Mfg. Co., Wellsville, N. Y. p.

ONE 13-INCH x 16-INCH ERIE THROTtling engine for sale, built by Erie Engine Works. Band wheel 7 ft. diameter, 16-inch face. In very good condition. One 14-inch x 12-inch Skinner automatic engine. 300 R. P. M., with complete oil circulating system, direct connected to a 60 K. W. General Electric D. C. generator, type M. P., 220 volts. Both engine and generator in strictly first class condition. These engines can be seen in operation at our plant. Address The Youngstown Foundry & Machine Co., Youngstown, O.

SCRAP WANTED.

TAKE NOTICE. WE ARE BUYERS OF all grades of scrap metals, such as scrap copper, brass, lead, babbitt metals, factory metal skimmings, drosses, metal clippings, spelter, etc. Advise quality and quantity you have on hand to offer and we will name best prices f. o. b. your city. H. Kander & Co., Bowling Green, Ohio. I. T. R.

WANTED, MISCELLANEOUS.

WANTED, A SECOND-HAND OR NEW ice plant of from 20 to 50 tons capacity, must be in good order and cheap. Prompt reply wanted. Address Edgar A. Weimer, Lebanon, Pa. p.

WANTED A MANUFACTURER TO manufacture a cotton boll weevil destroyer, consisting of wheels, axles and frame work, on which an exhaust fan is to be mounted, together with equipment. Will furnish drawings of same—patents pending. Address R. P. Johnson and E. W. Ramsey, Dalley, La. p.

Machinery For Sale.

We have installed a new electric power plant, and have for sale the following second-hand machinery in good condition.

If you are interested, we will be glad to quote you prices on all or any part of same, F. O. B. cars Pittsburg, Pa.

ENGINES FOR SALE

1—10″ & 16″ x 13″ x 24″ Wilson-Snyder Mfg. Co. Duplex outside center packed plunger pump with 14″ suction pipe, 60 ft. long and 14″ twin strainer.

1—Otto Gas Engine, 100 H. P. with gas regulator, muffler oil cups, electric battery, hand starting air pump, 2 fly wheels 8′ 0″ dia., 8″ face, pulleys on engine 5′ 5″ diameter, 23″ face, and one Moore & White friction clutch pulley 7′ 0″ diameter, 21″ face, 6″ bore.

1—Otto Gas Engine, 100 H. P., 190 Rev. per minute with gas regulator, muffler oil cups, electric battery, hand starting air pump, belt driven air pump and tank. Two fly wheels 8′ 0″ diameter, 8″ face, engine pulley 5″, 6 x 22″ face. One Moore & White friction clutch pulley 82″ diameter, 21″ face and 6″ bore.

1—Mertes two-cylinder Gas Engine, 100 H. P., in first class condition with air pressure tank, belt driven air pump. Electric battery for sparking plugs, gas regulator, oil cups, exhaust muffler, bolt fly wheel 6′ 10″ diameter, 18½″ face, Moore & White friction clutch pulley, 8′ 0″ diameter, 21″ face, 6″ bore.

1—13″ x 16″ Vertical Engine of New York Safety Steam Power Co. make. Steam pipe 3″, exhaust pipe 3½″, diameter of shaft 5⅞″, belt fly wheel 54″ diameter, 18″ face outboard bearing throttling governor. Heighth from floor to top of cylinder 8′ 6″, height from floor to center of shaft 15½″, floor space required 5′ x 8′. Weight of engine complete, about 7,500 lb. Everything in first-class condition.

1—16″ x 18″ Vertical engine of New York Safety Steam Power Co. make. Steam pipe 4″, exhaust pipe 4½″, dia. of shaft, 7″. Outboard bearing belt fly wheel 7′ 0″ diameter, 20″ face. Throttling governor. Height from floor to top of cylinder 9′ 11″. Height from floor to center of shaft 18″. Floor space required 8′ x 9′. Weight of engine complete, about 14,500 lb. Everything in first-class condition.

1—12″ x 15″ Horizontal Engine center crank self contained fly wheel 48″ diameter, 5½″ face, belt wheel 42″ diameter, 12″ face. Throttling governor 3″, steam pipe 3½″ exhaust. Height from floor to center of shaft 15″. Floor space required 5′ 6″ x 9′ 6″. All in first-class condition.

1—10″ x 16″ horizontal engine outboard bearing 4″ diameter shaft fly wheel 5′ 0″ diam., 5″ face, belt wheel 42″ diameter, 14″ face. Throttling governor. Steam pipe, 2½″ exhaust pipe from floor to center of shaft 15″. Floor space required 6′ x 10′; bed plate of this engine is cracked and reinforced with a plate and bolt. This break does not hurt the running of the engine.

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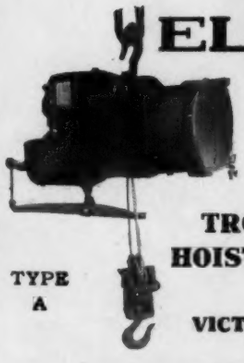

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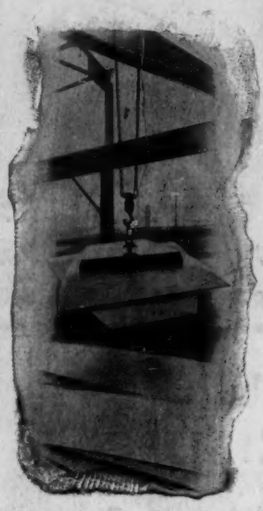

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